REPORT

OF THE

COMMISSION OF INQUIRY ON GANGES WATER POLLUTION

JULY 1969

DEPARTMENT OF PETROLEUM

MINISTRY OF PETROLEUM & CHEMICALS AND MINES

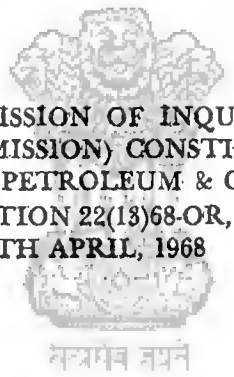
GOVERNMENT OF INDIA, NEW DELHI

REPORT

OF

THE COMMISSION OF INQUIRY
(GANGES WATER POLLUTION COMMISSION)

REPORT OF THE COMMISSION OF INQUIRY (GANGES WATER POLLUTION COMMISSION) CONSTITUTED UNDER MINISTRY OF PETROLEUM & CHEMICALS NOTIFICATION 22(13)68-OR, DATED 20TH APRIL, 1968



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INDEX OF ABBREVIATIONS

MM Series	Affidavits of Monghyr Municipality
BG Series	Affidavits of Bihar Government
R Series	Affidavit of Barauni Refinery
MMD Series	Documents of Monghyr Municipality
BGD Series	Documents of Bihar Government
BRD Series	Documents of Barauni Refinery
CWD Series	Documents produced by witnesses
OD Series	Documents from others
MMW Series	Monghyr Municipality witnesses
CW	Commission's witnesses
ER	Evidence Record
IOC	Indian Oil Corporation
I.I.P.	Indian Institute of Petroleum
PHED	Public Health Engineering Department, Bihar Government
PPM	Parts per million
Cm	Centimetres
M^3	Cubic metres
Max	Maximum
KL	Kilolitre
EPS	Effluent Pumping Station
A.V.U.	Atmospheric Vacuum Unit
K.T.U.	Kerosene Treating Unit
G.B.	Guard Basin
O.S.	Oil Separator
S.A.	Silt Accumulator
E.B.	Emergency Basin
S.T.	Sand Trap
ATF	Aviation Turbine Fuel
S.K.	Superior Kerosene
K.O.	Kerosene Oil
K	Kerosene
OM & SR	Oil Movement and Storage Receipt
OM & SD	Oil Movement and Storage Despatch
Tk	Tank
P.U.	Power and Utilities
TTL	Tank Truck Loading
W & E	Water and Effluent
G.M.	General Manager
DGM (T)	Deputy General Manager (Technical)
C.E.E.	Chief Electrical Engineer
C.M.E.	Chief Mechanical Engineer
X.E.N.	Executive Engineer
D.E.E./D.E.E. (P & U)	Deputy Electrical Engineer
Dy. C.P.N.	Deputy Chief Production Engineer
P.E.	Production Engineer
A.E. (PH)	Assistant Engineer, Public Health
P.M.	Plan Manager
D.M.E.	Deputy Mechanical Engineer
Shift D/H	Shift Division Head

ACKNOWLEDGEMENT OF ASSISTANCE

The Commission is happy to place on record its appreciation of the great assistance that it has derived from the written arguments prepared with care and filed before the final oral arguments which lasted for about a fortnight. But for their help in classifying the material evidence contained in the affidavits filed on behalf of all the parties as well as the oral evidence adduced, it would have been difficult if not impossible for the Commission to go through the voluminous record consisting of about 1260 pages of oral evidence and about 210 pages of the affidavits. It is indeed a matter of gratification that by and large the standard of arguments were kept up on a high level expected of respectable and responsible members of the Bar.

The Commission records its gratitude to the Government of Bihar who made very satisfactory arrangements by providing chairs, table and shamiana for the four sittings of the Commission at the Barauni Thermal Power Station Guest House and also making arrangements for transport to and fro, and making available reporters both in English and Hindi to the satisfaction of the members of the Commission.

The Commission also records its felicitations to the Ministry of Petroleum and Chemicals and to their Joint Secretary (Shri M. V. Rajwade) in particular and Shri R. K. Sinha, Under Secretary for making all satisfactory arrangements in the different refineries which the members visited for getting first hand knowledge of its working and effluent disposal system and also for providing the Committee Room in North Block and another equally big hall at Shastri Bhavan for holding its sittings at Delhi on different dates.

The Commission also records its gratitude to the Law Institute, Delhi for allowing it to hold some of its sittings in its Seminar Room.

The Commission offers its felicitations and thanks to the press reporters who have covered the entire proceedings lasting over a fairly long period of time and published reports which have been fairly correct and fair. It also acknowledges the cooperation it has received from the press in the discharge of its onerous duties.

The Commission offers its thanks to the management of the various refineries it visited, the way they discussed the matters and explained the method of discharge of the effluent adopted by them.

Finally the Commission freely acknowledges its indebtedness to Shri N. Krishnamurthy of the Law Ministry who was deputed to perform the duties of the Secretary to the Commission which he has discharged to the best of his ability and entire satisfaction of the members of the Commission. His knowledge and experience has been of immense help to the Commission and his courtesy and tact in handling many delicate situations that arose in connection with the inspection of the records were indeed exemplary.

The Commission also freely acknowledges its indebtedness to Shri L. D. Panjabi of the Ministry of Petroleum & Chemicals who was also deputed to perform the duties of a Technical Assistant to Shri N. Krishnamurthy which he discharged to the entire satisfaction of the Commission, more so when the Secretary, Shri N. Krishnamurthy fell ill and was in the hospital for two months, taking the entire burden on himself single-handed—without any assistant. His knowledge and experience also has been of great help to the Commission. Over and above this, his courtesy and tact in handling many delicate situations that arose frequently were very exemplary. He and the Secretary have all along been very helpful in their inspection tours of the refineries by the members of the Commission.

The Commission also records its gratitude to the other members of the staff who not only cooperated with the Commission but carried the work to the best of their capability.

CHAPTER I

INTRODUCTION

Constitution of the Commission of Inquiry

On 3rd March, 1968, there was a blaze in the river Ganges near Monghyr in Bihar State. On the basis of the investigation made by the concerned authorities, the Government of India in the Ministry of Petroleum and Chemical decided to order a full investigation into what actually happened and to allocate the responsibility where necessary and to devise steps to guard against such events in future. For this investigation the Government proposed to appoint a four Member Commission consisting of a retired High Court Judge as Chairman and two experts in Public Health Engineering and one in Oil Technology as Members under the Commissions of Inquiry Act, 1952.

Accordingly by Notification 22(13)/68-OR dated the 20th April, 1968 (31 Chaitra 1890 S) issued by the Ministry of Petroleum and Chemicals and published on the same date in Part I, Section 1 of the Gazette of India, the Central Government in exercise of the powers conferred on it by Section 3 of the Commissions of Inquiry Act, 1952 (Act 60 of 1952) constituted the present Commission to inquire into and report about the occurrence. The full text of the said notification is set out below:

NOTIFICATION

New Delhi, 20th April 1968, *31st Chaitra* 1890 *S*

Resolution No. 22(13)/68-OR—The Government of India have decided to set up a Commission under the Commissions of Inquiry Act, 1952, consisting of the following:

Chairman—Sri Manohar Pershad

Members—

Sri N. V. Modak

Sri K. R. Bhide

Dr. M. G. Krishna

2. The terms of reference of the Commission will be as follows:

(i) to determine the correct facts of the contamination with oil of the river Ganges near and downstream of the Barauni Oil Refinery during the last week of February and the first week of March 1968 (or earlier);

(ii) to determine to what extent the Barauni Oil Refinery has been responsible for the happenings;

(iii) to recommend the steps that must be taken to prevent the recurrence of such happenings in refineries in the future;

(iv) to advise on whether there has been any negligence or carelessness on the part of the refinery management and staff in the discharge of their prescribed duties;

(v) arising out of (iv): to recommend further action, if any, that must be taken;

(vi) to report on the loss or damage to the public caused by the pollution of the water and to recommend what, if any, restitution the Indian Oil Corporation should make in that connection to those adversely affected; and

(vii) generally, to report on any other matter that is relevant in the opinion of the Commission.

3. The Commission will be assisted by special consultants wherever necessary and desired by it.

4. The Commission will devise its own procedure. It may call for such information and take such evidence as it may consider necessary. The Ministries/Departments of Government of India will furnish such information and render such assistance as may be required by the Commission. The Government of India trust that the Government of Bihar and all others concerned will extend their fullest co-operation and assistance to the Commission.

5. The Commission will submit its report within a period of three months.

ORDER

Ordered that the Resolution be published in the Gazette of India in Part I, Section 1.

Ordered also that a copy of the resolution be communicated to all Ministries/Departments of Government of India, Government of Bihar and all others concerned.

Sd. E. N. MANGATRAI
Special Secretary to Government of India

Under the above terms of reference the Commission was required to submit its report within three months, that is, by 20th July, 1968. As replies to the questionnaire were not received in time and parties wanted extension of time the Commission could not complete the inquiry and submit its report within the time and so that period was extended to 31-10-1968 for final report. Even by this time the Commission could not submit its report because of the time taken in the examination of witnesses, hearing the arguments and visiting the various refineries and so the period was extended till 30th April, 1969, and subsequently to 31st July, 1969.

As per the terms of reference, the Commission was at liberty to devise its own procedure for collecting information and for ascertaining whether there was any negligence or carelessness on the part of the refinery management and staff in the discharge of their prescribed duties and, if so, to what extent.

II. *Relevant provisions of the Commissions of Inquiry Act and Rules framed thereunder.*

At this stage we would like to refer very briefly to the relevant provisions of the Commissions of Inquiry Act, 1952, (hereafter referred to as the Act) and the Rules made thereunder.

Section 3 of the Act confers power on the appropriate Government "to appoint by a Notification in the Official Gazette a Commission of Inquiry for the purpose of making an inquiry into any definite matter of public importance and performing such functions and within such time as may be specified in the Notification."

The 'appropriate Government' as defined by Section 2 means the 'Central Government in relation to a Commission appointed by it to make an inquiry...'.

Section 12 authorises the 'appropriate Government' to make rules to carry out the purposes of this Act. In exercise of the powers conferred on it by Section 12 of the Act, the Central Government made rules from time to time.

Rule 2 provides for notices to persons for giving evidence and sub-rule (i) of that rule runs thus:

"2(i) The Commission shall as soon as may be after its appointment:

(a) issue a notice to every person, who, in its opinion should be given an opportunity of being heard in the inquiry, to furnish to the Commission a statement relating to such matters as may be specified in the notice; and

(b) issue a notification to be published in such manner as it may deem fit, inviting all persons acquainted with the subject-matter of the inquiry to furnish to the Commission a statement relating to such matters as may be specified in the Notification."

Sub-rule (ii) requires an affidavit to be filed in support of the facts set out in the statement and sub-rule (iii) refers to documents which have to be furnished to the Commission along with the statement.

Rule 3 lays down the procedure to be followed by the Commission after the statements are furnished to it under Rule 2.

Sub-rule (i) of Rule 3 prescribed as follows:

"the Commission shall examine all the statements furnished to it under Rule 2 and if after such examination, the Commission considers it necessary to record evidence, it shall first record the evidence, if any, produced by the Central Government and may thereafter record in such order as it may deem fit:

(a) the evidence of any person who has furnished a statement under Rule 2 and whose evidence the Commission, having regard to the statement, considers relevant to the purpose of the inquiry; and

(b) the evidence of any other person whose evidence, in the opinion of the Commission, is relevant to the inquiry."

Rule 4 safeguards the interests of persons likely to be prejudicially affected by giving them a right of hearing and Rule 5 gives the right of cross-examination and representation by legal practitioner to certain persons referred to therein.

Rule 6 lays down: "the Commission shall have the power to regulate its own procedure in respect of any matter for which no provision is made in the Rules."

CHAPTER II

POWERS AND FUNCTIONS OF A COMMISSION UNDER THE ACT

1. *Interpretation of the provisions of the Act*: The title of the Act describes itself as "an Act to provide for appointment of Commissions of Inquiry and for vesting such Commissions with certain powers".

Section 3 enjoins that the appropriate Government may appoint a Commission of Inquiry for the purpose of "making an inquiry into any definite matter of public importance and performing such functions and within such time as may be specified in the Notification" and the duty of the Commission so constituted is only to make the inquiry and perform such functions accordingly.

Three things are implicit in this Section, *viz.*,

(i) that the subject-matter of inquiry must be "a definite matter of public importance";

(ii) that the scope, power and authority of the Commission are to make an inquiry into that definite matter of public importance; and

(iii) to perform such functions as may be specified in the Notification.

The Commission, in its first meeting held at Delhi, thought that the scope of reference (iii) was very limited. It, therefore, requested the Government to enlarge its scope. Accordingly the Government, by its Notification No. 22(13)/68-OR dated 22-5-1968, enlarged the scope by amending reference (iii) in the following form:

> "to recommend the steps that must be taken to prevent the recurrence of such happenings in refineries in the future."

In the original Notification issued constituting the present Commission there was no reference to the applicability of the provisions of sub-sections 2, 3, 4 and 5 of Section 5 of the Commissions of Inquiry Act and the attention of the Government being drawn to this fact, the Government of India by another Notification 22(13)/68-OR dated 30-7-1968 added the following paragraph after para 4:

> "4(a) The provisions of sub-section 2, sub-section 3, sub-section 4 and sub-section 5 of Section 5 of the Commissions of Inquiry Act, 1952, shall apply to the Commission."

The pollution of the river water is really "a definite matter of public importance" as it affects the health of the individuals, animals and fish. It is this definite matter of public importance that this commission has been enjoined by the Notification "to inquire into and report on". For the discharge of its duties the Notification has conferred certain powers on the Commission. It is the duty of the Commission, by exercising its powers, to collect evidence not only from the parties who are before the Commission but also from any member of the public who may be able to furnish information bearing on the allegations contained in the Memoranda of the Monghyr Municipality and the Bihar Government to examine the evidence to reach what conclusions appear to it to flow from such evidence and to submit its "report" to the appropriate Government which constituted the Commission. The subject-matter of inquiry by the Commission thus being a definite matter of public importance any member of the public has an interest in this inquiry. Indeed it is this object for which Rule 2(1)(b) is framed which requires the Commission to issue a notification inviting the members of public acquainted with the subject-matter of the inquiry to furnish to the Commission a statement relating to such matters as may be specified in the Notification. The public, therefore, have an interest in the inquiry. Once such an inquiry is initiated either at the instance of any one person or party, as the case may be, or at the initiative of the Government, the Commission is bound to proceed with the inquiry and submit its report unless the Government under Section 7 of the Act declares that this Commission shall cease to exist. Even in the case where a Commission of Inquiry is set up at the instance of an individual or party that individual or party cannot stop the inquiry by abandoning its allegations. It is clear, therefore, that the inquiry to be made by the Commission differs from a civil litigation or a criminal proceeding pending before an ordinary Court of Law. In a civil action there are two parties—one arrayed as a plaintiff and the other the defendant. There is a lis or issue between them which the plaintiff may choose to abandon. Similarly in a criminal case there is a prosecutor and an accused and a charge which the prosecutor may withdraw with or without the permission of the Court as provided in the Criminal Procedure Code. In both these cases the issue or charge has to be determined by the Court by a judgment or order which becomes binding and enforceable as between the parties. In an inquiry under the Act there is no plaintiff or a prosecutor, there is no defendant or accused, there is no lis or charge to be adjudicated upon by the Commission by a judgment or order binding and enforceable inter-parties. In other words, the Commission is not expected and indeed it is not competent to

finally adjudicate upon any issue or charge or pass any judgment or order which will be binding and enforceable. Its function is only to inquire and to report to the appropriate Government. It is obvious, therefore, that the Commission is only a machinery set up by the appropriate Government to inquire into a definite matter of public importance, to collect such relevant materials as it may consider necessary, and to make a report to the appropriate Government giving its views on the basis of such materials so as to inform the mind of the appropriate Government and to enable it to take such action as it may, in the circumstances, think fit. This, in short, is the nature and scope of the powers and functions of a Commission constituted under the Commissions of Inquiry Act, 1952. This was explained by the Commission to the representatives of the parties present before it at the Thermal Power Station Guest House, Barauni, on the 13th August, 1968.

2. *Judicial pronouncements on the meaning and import of the Act*: The Supreme Court in the case of Sri Ramkishen Dalmia, *vs.* Sri Justice S. R. Tendolkar and others (AIR 1958 SC 538) have explained the nature and scope of the powers and functions of a Commission constituted under the Act thus:

> "in each case the question is: is there a definite matter of public importance calling for an inquiry... Quite conceivably the conduct of an individual or company or a group of individual persons or companies may assume such a dangerous proposition and may so prejudicially affect or threaten to affect the public well-being as to make such conduct a definite matter of public importance urgently calling for a full inquiry."

It follows, therefore, that the existence of a definite matter of public importance is the *sine qua non* for the exercise of its powers by the appropriate Government to constitute a Commission under the Act.

The Court further explained the powers and functions of the Commission in the following terms:

> "the only power that the Commission has is to inquire and make a report and embody therein its recommendations. The Commission has no power of adjudication in the sense of passing an order which can be enforced proprio vigore. A clear distinction must, on the authorities, be drawn between a decision, which by itself has no force and no penal effect and a decision which becomes enforceable immediately or which may become enforceable by some action being taken."

It further observed: "an inquiry necessarily involves investigation into facts and necessitates the collection of material facts from the evidence adduced or brought to the notice of the person or body conducting the inquiry and the recording of its findings on those facts in its report cannot but be regarded as ancillary to the inquiry itself, for the inquiry becomes useless unless the findings of the inquiry body are made available to the Government which set up the inquiry."

The Law Commission agreed that the Act should remain on the Statute Book.

3. *Powers and functions of the present Commission*: This Commission has been constituted by the Central Government by a Notification issued by it in exercise of its powers under the Commissions of Inquiry Act, 1952. For the purpose of ascertaining the definite matter of public importance which this Commission is to inquire into and report on, reference must be made to the terms of the Notification. For reference to the terms see Appendix I.

The Notification in express terms requires this Commission to inquire into and report on the causes of pollution of the Ganga river water, the party responsible for the same and suggest preventive measures. The powers and functions of the present Commission are circumscribed by the terms of the Notification.

CHAPTER III

EVENTS THAT LED UP TO THE PRESENT INQUIRY

The Barauni Refinery came into operation in January 1964 as a result of an agreement concluded on the 28th September, 1959, between the Government of India and the Government of U.S.S.R. The discharge of effluents from the Barauni Refinery has been based on a worked out and calculated project which was examined and approved by the Public Health and the Public Health Engineering authorities of the Bihar Government before it came into operation. The refinery has been working and discharging the effluent since it started operation and there has been no complaint till the date of the present incident. In the early hours of 3rd March, 1968, the water supply to Monghyr town was suspended as the water supply authorities noticed oil on the surface of the water near the intake pumping sets. This fact was brought to the notice of the Barauni Refinery authorities as well as the officials of the Bihar Government. The Barauni Refinery authorities undertook detailed inspection at Barauni and Monghyr. The officers of the Bihar Government also made inspection. On the 3rd March, 1968, a fire was reported near the barge which carried the pumping sets. Again on the 6th there was a minor fire near the Kastaharni Ghat. The water supply to the Monghyr town remained substantially suspended till the 9th March. There were also some reports of about 5-6 deaths and accounts of considerable hospitalisation as a result of water pollution which fact was denied by the State Government through the newspapers of the 9th and 10th March, 1968. The working of the refinery was also stopped from 7th March for some time. Meanwhile the Ministry made enquiries through technical personnel and other officers of the Indian Oil Corporation and with the assistance of a Chief Engineer from the Central Water & Power Commission, an expert of the Indian Institute of Petroleum and officers of the Public Health Department of the Bihar Government. The enquiries made by the Officers revealed accumulation of oil content of the effluent matter in the sandy part of the river bed beyond the discharge point. As a consequence the effluent from the refinery instead of discharging into the river from the effluent pipe, flowed through a channel of its own before it joined the mainstream. Government were advised to stop the flow of effluent through the existing channel and provide an effective flow direct from the discharge point into the river. After this was done the refinery started functioning again. Since it was found necessary to determine what actually happened and allocate responsibility and devise steps to guard against such events in future the Central Government decided to order full investigation into all these matters by a Four-Member Commission appointed under the Commissions of Inquiry Act.

CHAPTER IV

PRELIMINARY PROCEEDINGS AND DIRECTIONS

The first meeting of the Commission was held on the 9th May, 1968, in room No. 210, Wing B, Shastri Bhavan, Dr. Rajendra Prasad Road, New Delhi-1, in two sessions—the first starting at 11.30 AM and the second at 3.00 PM.

The Commission first discussed the administrative arrangements made for its working until then with Sri M. V. Rajwade, Joint Secy. to the Government of India and Sri S. R. Sundaram, Deputy Secretary in the Ministry of Petroleum & Chemicals.

The Commission then discussed the terms of reference enunciated for it by the Government. After discussion it was decided to suggest to the Government an amendment to term (iii) which should be amended to read as follows:

> "to recommend the steps that must be taken to prevent recurrence of such happenings in Refineries in future."

Accordingly the Government in the Ministry of Petroleum and Chemicals passed a resolution, dated 22.5.1968, No. 22(13)/68-OR "in partial modification of Ministry of Petroleum & Chemicals (Department of Petroleum's) resolution No. 22(13)/68-OR, dated 20.4.1968", para 2(iii) of the same is amended to read as under:

> "to recommend the steps that must be taken to prevent the recurrence of such happenings in Refineries in future."

ORDER

Ordered that the Resolution be published in the Gazette of India, Part I, Section 1. Ordered further that a copy of the resolution be communicated to all Ministries/Departments of Government of India, Government of Bihar and all others concerned.

Sd. M. V. RAJWADE

Joint Secretary to the Government of India

The Commission after careful thought found it necessary to issue notices under Rule 2(1)(a) to the Chairman, Monghyr Municipal Board, Monghyr, General Manager, Barauni Refinery and the Works Manager, Jamalpur Railway Workshop, Jamalpur, as, in its opinion, they were the parties who should be given an opportunity to be heard. Accordingly the Commission prepared the form of notices to be issued under Rule 2(1)(a) and also the questionnaire. The first notice under Rule 2(1)(a) was issued to the Chairman, Municipal Board, Monghyr, Bihar State, the General Manager, Barauni Refinery, Barauni, Monghyr District, Bihar State and the Works Manager, Jamalpur Railway Workshop, Jamalpur (E.R.), District Monghyr (Bihar) on 10.5.1968.

For reference to the notices issued to the Chairman, Monghyr Municipal Board, Monghyr, the General Manager, Barauni Refinery and the Works Manager, Jamalpur Railway Workshop, see Appendix II.

As the subject matter of the inquiry is "a definite matter of public importance" the Commission in its first sitting also thought it necessary to issue a general notification under Rule 2(1)(b) calling upon the members of the public acquainted with the subject-matter of the inquiry to furnish to the Commission a statement relating to such matters as may be specified in the notification. Accordingly the Commission prepared the form of notification and directed a notification under Rule 2(1)(b) to be published in the leading newspapers. Persuant to this direction notifications, dated 10.5.1968 were published in the newspapers in Hindi and English both at New Delhi, Patna and Calcutta as shown in Appendix III.

For reference to the text of the notification see Appendix IV.

In response to the notice under Sec. 2(1)(a) directing the parties to file their statements along with the affidavits till 7th June, 1968, which was extended to 23.6.1968, on the receipt of a telegram from the Chairman, Monghyr Municipal Board, for extension, the Barauni Refinery filed its statement supported by an affidavit within time, *i.e.*, on 21st June, 1968. The Monghyr Municipal Board also filed its statement along with 29 affidavits within 23rd June, 1968. Subsequently it filed 8 more affidavits of other individuals, on 8.7.1968. Thus in all it has filed 37 affidavits. All these are marked "MM" series.

The Works Manager, FNG, Jamalpur, filed the statement within time but since it was not accompanied by four affidavits as directed in the notification, the Secretary, Commission of Inquiry, requested the Works Manager, FNG, to furnish five copies immediately to the Commission in the form of an affidavit subject to the acceptance of the same by the Commission. Since the representation sent by the Works Manager,

FNG, for the Deputy Chief Mechanical Engineer, Jamalpur, was not in the proper form and accompanied by four affidavits as required under the notification this representation was not accepted by the Commission and a direction was given to the Secretary to return the papers to the party concerned. Accordingly the papers were returned and no further request for accepting the statement was made any time subsequently.

The Commission decided to hold the next meeting on the 24th June, 1968. But this meeting could not be held as representation was received from the Bihar Government by a telegram, dated 20.6.1968 requesting for extension of time upto 15.7.1968. It may be stated here that no notice was given to the Bihar Government. The Bihar Government of its own made a request for time to file the statement probably after having read in the newspapers the notification published under Section 3(1)(b) of the Act or some how come to know of the inquiry. This request was granted and time was extended till 7-7-1968 and the Commission directed the meeting to be fixed on the 10th July, 1968. On the 8th July a trunk telephone came from the Secretary, Bihar Government, asking for a further extension till the 15th July, 1968. The next day a telegram was received from Sri R. B. Singh, Advocate on behalf of the Bihar Government for extension till 15.7.1968. The request was granted. At the second sitting of the Commission held on 10.7.1968 at the same place, the Commission first decided to inspect the Barauni Refinery and accordingly prepared programme fixing 9th and 10th August, 1968, for inspection after intimating the parties concerned to be present on the spot. It also decided to inspect the site of the incident at Monghyr and fixed 11th August for that purpose after intimating the parties to be present there. It also decided to visit some coastal and inland refineries, namely:

1. Cochin refinery
2. Gujarat refinery
3. Burmah Shell refinery
4. ESSO refinery
5. Gauhati refinery

with a view to study the treatment methods adopted by the above refineries and to obtain a comparative idea of the practice prevailing at the Barauni Refinery. Accordingly it directed the Secretary to address letters to the refineries intimating to them about the proposed visit of the Commission and to write to them to furnish certain documents and provide facilities for the intending visit of the Commission.

The Commission in its second sitting starting at 3.00 PM first took up the maps submitted by the refinery and after carefully going through them took up the statements and the affidavits filed by the refinery and the Monghyr Municipality. Each statement and affidavit was read through carefully. As this work could not be finished on the 10th July, the Commission met again at 11.00 AM on the 11th and completed the consideration of the statements and the affidavits of the Barauni Refinery and the Monghyr Municipality. As the Bihar Government had not filed by then its statement and affidavit the same could not be considered then.

The Commission had to meet again on the 12th to discuss certain administrative matters with Sri M. V. Rajwade.

On 15.7.1968, the Bihar Government filed its Memorandum accompanied by 9 affidavits. Subsequently six more affidavits were filed on 22.7.1968. All these are marked "BG" series. This memorandum and affidavits were discussed by the Members at Barauni when they met together.

As previously arranged the Members of the Commission met at Delhi on the evening of 7th of August and after some preliminary discussions started for Patna to go to Barauni Refinery. The Secretary and the staff had proceeded earlier.

The Commission reached Barauni on 8.8.1968 in the evening and went to the Refinery on 9.8.1968 at 9.00 AM where all the representatives of the parties including the representative of Jamalpur Railway Workshop were present. They all assembled first in the Chamber of the General Manager, Barauni Refinery, and from there started for inspection. At the time of inspection the Members of the Commission made it clear to the refinery authorities that they do not intend seeing the system of the work of the refinery in general and only wanted to inspect quality control of the effluent and check of oil dips in guard basins, oil receiving weirs, sand trap, emergency basin, oil separators, pumping pits, etc., in Sector VI, the effluent channel beyond the outfall point, operation of slop oil pumps and tanks, effluent disposal outside the refinery and the sewage treatment plant. Also they would like to inspect Sectors III, IV, V and VII. The Commission spent first two days, *i.e.*, 9th and 10th August for inspecting the aforesaid sectors. It also divided into two groups to see the effluent discharge pipe leading to the Ganga river and flooded area where the effluent flowed in a channel into the Ganges. Two Members (the Chairman and Dr. Krishna) flew in a helicopter along with the General Manager, Barauni Refinery, separately over the sewage treatment plant, effluent discharge pipe leading to the Ganga river. The other two Members (Sri Modak and Sri Bhide) went in a jeep to inspect the effluent discharge pipe-line upto a distance of 3 kms. from Gupta Bund as the rest of the pipe-line was under water. Subsequently after the flight the other Members (the Chairman and Dr. Krishna) also inspected the effluent discharge pipe-line in a jeep. Thereafter they visited the

sewage treatment plant and effluent pumping station and collected samples from various places and sent them for analysis.

During the course of inspection the Commission sought clarifications on some points from the General Manager, Barauni Refinery, and asked him also to supply one set of the piping and instrumentation diagrams showing detailed pipe connections for Sector VI (complete) and Sectors III, IV and V. The ex-General Manager, Barauni Refinery, gave a statement—Ex. "R" (CWD 17). The Commission also asked the refinery management to give them the log books of the refinery for the period beginning from the 1st February to 6th March, 1968, which they handed over. They are marked Ex. BRD 1 to BRD 18. After inspecting the refinery the Commission proceeded to Monghyr and visited the Ghats where oil floating on the surface was detected on the 3rd March, 1968, and the places where barges were stationed. Here also all the representatives of the parties including the representative of Jamalpur Railway Workshop were present. Thereafter the Commission visited the Water Works Pumping Station and had discussion with the officer-in-charge. There the Commission was given the samples of oil collected at the incident. On the 12th the Commission again went to the Refinery to clear certain points arising out of the log books. On the 13th August the Commission had its third meeting in the Thermal Power Station Guest House, Barauni, where all the representatives of the Barauni Refinery, Monghyr Municipality and Bihar Government were present to discuss the procedure to be adopted. In this meeting the representative of the Jamalpur Railway Workshop stated that he had no interest in the inquiry and did not participate in the proceedings thereafter. This meeting was first scheduled to be held at Patna; but as all the representatives were present at Barauni, the Commission thought it proper to have the meeting there alone instead of Patna with the agreement of all. In this meeting it was explained to the representatives that the Commission in its second meeting at Delhi and subsequently at Barauni had gone through the Memoranda and affidavits in detail and were giving the gist of the same as they understood and asked them to correct if there was any mistake anywhere. After the gist was given, the representatives stated that there was no mistake and that the Members had correctly understood the case set up in each of the Memoranda. They were next explained the scope and nature of the inquiry.

Thereafter, Sri Misra, Chairman, Monghyr Municipal Board, drew the attention of the Commission to Annexure II sent along with his memorandum filed on 22.6.1968 to summon witnesses and requested the Commission to call those witnesses. The Commission pointed out that under Rule 3(i) of the Act no party had the right to produce evidence and under the above provision discretion was given to the Commission only to call any witness it liked. It was also pointed out that after going through the affidavits in detail if the Commission felt the need to summon any witness or witnesses the parties would be intimated of the same. It was also suggested to them that the Commission would go through the list of the witnesses filed and if it found that the evidence of any witness was necessary it would summon those witnesses also. Sri Misra was then requested to point out from the list the names of the witnesses he wanted to examine. After going through the entire list item-by-item the Chairman, Monghyr Municipal Board, stated that he would like to examine the witnesses at S. Nos. 18, 19, 21, and 22 to 25. Apart from these he asked the Commission to examine Sri Ayyar, Head, Electrical Department, Sri Harnal, Deputy General Manager and when the Commission stated to him that they do not wish to examine Sri Ayyar and Sri Harnal and if he wanted to examine them as his witnesses he may make such a request and the Commission would examine it along with such other requests and pass orders. The Chairman, Monghyr Municipal Board, stated that he would not like to examine them as his witnesses. It was further stated by the Chairman, Monghyr Municipal Board, that if the Commission permits him to file the affidavits of the persons whose S. Nos. are 40 to 45 which were sent back to him as having been filed after the expiry of the date fixed he would not insist on their being examined orally. This request was granted and the affidavits of these five persons were filed subsequently which were accepted. The lawyer for the Barauni Refinery wanted the copies of the affidavits and documents filed by the Monghyr Municipality and the Bihar Government. The Chairman, Monghyr Municipality and the Pleader on behalf of the Bihar Government agreed to supply the copies and as a matter of fact these copies were given to him in the presence of the Commission. The learned Advocate for the Barauni Refinery wanted to cross-examine Sri Misra; but when the Commission drew his attention to the fact that witness whose evidence was recorded could only be cross-examined the Counsel agreed. Sri Misra next sought the permission of the Commission to move a request for calling certain documents from the refinery. He also laid great emphasis on the examination of log books maintained by the Electrical Department. The Chairman was assured by the Commission that they would examine this position also and pass appropriate orders. The Commission gave two weeks' time to the parties to file documents if they so choose and supply copies to the other parties. The Commission then asked the members present that in case it was of the view that oral evidence has to be recorded which was the best place for recording the oral evidence and after some discussion it was agreed that evidence should be taken in the Barauni Thermal Power Guest House sometime in the second week of September, 1968.

In the afternoon of 13th August, 1968, the Members of the Commission had a sitting at the Guest House and again on the evening of the 14th August at Delhi at the residence of Sri Modak to consider the question whether oral evidence had to be recorded. After a careful study of the memoranda and the pleas taken by the learned Counsels, the Commission felt the need of examining Sri Raghuramaiah (Minister of State), Ministry of Petroleum & Chemicals, Government of India, Sri N. N. Kashyap, Sri P. N. Kumra, Sri V. B. Hajela, Sri G. S. Harnal, Sri Maheshwari Pershad, Sri P. K. Misra, Sri K. P. Tuli, Sri Y. D. Puri and Sri B. D. Gupta and directed the Secretary to issue notices to the witnesses to be present at the Guest House.

CHAPTER V

GENERAL REFERENCE TO THE MEMORANDA OF BARAUNI REFINERY, MONGHYR MUNICIPALITY AND THE BIHAR GOVERNMENT

Gist of the Memorandum of Barauni Oil Refinery—On 3-3-1968 Sri K. B. Verma, OSD (legal) received information from the District Magistrate, Monghyr, to the effect that large quantity of oil was observed floating in river Ganga at Kastaharnighat and the Magistrate wished to know whether the oil was discharged into the river through the pipe-line of the refinery. The refinery authorities, after inspection by Sri Tuli, informed Sri Verma that no free oil was discharged. The refinery officers were directed to check the water samples from the guard basin, effluent pumping station and the point where the effluent meets the Ganges. The General Manager, Barauni Refinery, informed later the District Magistrate, Monghyr, that no oil was discharged beyond the prescribed limit. The officers of the refinery visited the point of effluent out-fall into the river and did not notice any abnormality. On an inspection of the channel by the officers of the refinery on the 4th March they found some dark patches of oil along the channel at some places and also a thin film of oil floating in a limited area near the barges at the ghat was observed. They further saw patches of oily material and sludgy stuff near the bank at a number of places.

The District Magistrate, Monghyr, came and took samples. The Health Minister, Government of Bihar, also visited the refinery. Even on the 10th March some pockets of trapped oil scum were observed by the Chairman, Indian Oil Corporation. Some brownish patches of oil were found floating in the lagoon.

In the after-noon of the 8th March, 1968, Sri Kumra, Chief Engineer, Central Water and Power Commission, accompanied by Sri Balwant Singh, Sri Sahay, Chief Engineer, Public Health, Bihar Government, went to Monghyr. On the way the river was inspected at Chak village ghat, Khawa, Madnipur and Amarpur, where they found some traces of brownish patches of algae and grease soaked with oily scum somewhat little more concentrated right from the effluent channel down to Monghyr and lower down. They also noticed patches of algae mixed with oily scum along the bank and oil floating on the surface of the effluent channel.

In the afternoon of 9th March, 1968, Sri Kashyap, Chairman, Indian Oil Corporation, accompanied by Sri Kurien, an expert from the Indian Institute of Petroleum, Sri Balwant Singh, Sri Tripathi, Additional Chief Engineer, Public Health, Bihar Government, went to Monghyr and visited the Kastaharnighat Intake, the Jamalpur intake, the water filteration station of Monghyr. At Kastaharnighat and Jamalpur ghat some brownish oily scum mixed with algae and weeds was seen on the river bank. They also saw small patches of brownish scum floating near the barge at the Jamalpur ghat.

In view of the design features of the oil recovery and the effluent discharge system it is not possible for oil, from the process units or from the tankage, directly to pass into the river. Even an occasional operational lapse in the oil recovery system cannot result in any large quantity of free oil finding its way to the river so as to cause a situation of the type which is alleged to have taken place at Monghyr. On account of the filteration effect of the sand, the water gradually seeped through the sand resulting in greater concentration of oil. Due to the slow movement of the effluent through the channel and practical stagnancy in the lagoon and the considerable settling time, there was greater accumulation of oil on the surface, which, combined with the algae, weeds, etc. formed a waxy scum. The high pour point of this scum combined with the low ambient temperature in winter possibly contributed to the increased formation of the scum which gradually drifted to the banks of the lagoon.

At the period when the ambient temperature rose in the end of February 1968 the sticky material disintegrated and helped by the wind direction gradually found its way into the mainstream of the river en-mass.

Ordinarily any oil which is free from scum is not expected to traverse a distance of 50 miles to create the situation as had occurred at Monghyr.

Gist of the Memorandum of the Monghyr Municipality—On 2-3-1968 at about 8.30 PM one Md. Wasim, the Pump Attendant, informed Sri Rajendra Narain Singh, the Water Works Superintendent, on phone, that oily substance was flowing in the Ganges and he stopped pumping. The Superintendent on getting the information rushed to the rapid Gravity Filter Plant and finding that oily greasy substance reddish and yellow in colour was floating in the storage tank and filter beds of the mechanical filter informed the Executive Engineer, who,

after seeing the said matter, ordered the stoppage of the pumping. then they rushed to the Kastaharnighat intake pumping station and found some oily substance floating in the Ganges which was giving smell of kerosene oil. They also found a layer of a greasy substance of about $\frac{1}{4}$" thick throughout on the surface near the barges.

The Chairman, Monghyr Municipality, received the information at 0.40 AM on 3-3-1968 and reached the ghat. The Municipal Commissioner also came. The Chairman after inspecting the filter plant, also saw a thick layer of sticky greasy oily substance. The Superintendent of Police, the Superintendent, Medical Hospital, the District Magistrate, the Medical Officer of Health and the Executive Officer, P.H.E.D. were informed.

The Chairman, Monghyr Municipality, contacted Sri Pandey, Head of the Department of Chemistry, R.D.&D. College, Monghyr, and called him for examining the oily substance. He came and took sample of greasy substance and reported that it contained petroleum products.

The water supply was stopped.

On 3rd March, 1968, the District Magistrate, Monghyr, visited the Water Works and made inspection of the Filter Plant. He also contacted Barauni Refinery and asked about the discharge. Then in order to trace the origin of the oily substance they decided to go up-stream in a motor launch. Just at that time fire was noticed in the Ganges near Jamalpur Railway Barge.

Subsequently the Health Minister of Bihar Government and other officers made an aerial survey and found oil floating.

However, discharge of oil and oily waste took place before 2-3-1968. Samples of effluent were taken. Drums containing oil were found. Log books were seized.

On 4-3-1968 the Chairman, Monghyr Municipality, and some others came to the refinery and questioned Sri Harnal about the oil being discharged from the refinery who denied that oil beyond the prescribed limit was discharged. When questioned as to how such a huge quantity of oil had come into the river he said that some dealer of oil products might have thrown it or Bata people might have thrown some refuse.

The Chairman met some employees of the refinery who informed him that huge quantity of oil was pumped through the effluent pumping station from 23rd February onwards.

One employee took him and the party to the effluent pumping station. There was a ditch which was found full of oil,

They inspected the pumps and the wells below pumps and found them full of oil and not water. Samples were taken. Log book entries were seen which showed that oil in profuse quantity was pumped.

They also saw ten big drums on the truck. The driver of the truck informed them that he was removing oil from about 11.30 AM. He also said that oil was taken out by buckets from the valves of the effluent discharge pipe-line running to the river. Sri Ayyar and Sri Harnal were present there.

Sample of oil from the drums was also taken.

The District Magistrate also found oil near valves on the pipe-line.

Sri Raghuramayya, Minister of State, also visited the site and also the refinery. He saw oil in profuse quantity in the ditch round about the effluent pumping station.

The Inspector of Factories, Monghyr, inspected the refinery. According to his report the discharge of such huge quantity of oil was either due to the defect in the oil separator units which were not functioning properly from 23-2-1968 or oil might have been discharged through sewage drain direct to the effluent pumping station.

Oil beyond the permissible limits had been discharged.

Municipality was put to unnecessary expenditure to the extent of Rs. 1,67,000. Apart from this it has claimed other amounts by way of damages and has suggested some safety measures for future and has asked the Commission to direct the refinery to pay the said amounts.

Gist of the Memorandum of the Bihar Government—Facts that emerge from the Memorandum and affidavits filed by the Bihar Government are these:

On 2-3-1968 at about 8.30 PM one Md. Wasim, Pump Attendant informed Sri Brajendra Narain Singh, Water Works Superintendent, on phone, that oily substance was flowing in the Ganges and he stopped pumping. The Superintendent on getting the information rushed to the Rapid Gravity Filter Plant and finding that oily greasy substance reddish and yellow in colour was floating in the storage tank and filter beds of the Mechanical Filter informed the Executive Officer, who, after seeing the said matter, ordered the stoppage of pumping. Then they rushed to the Kastaharnighat intake pumping station and found some oily substance floating in the Ganges which was giving smell of kerosene oil. They also found a layer of a greasy substance of about $\frac{1}{4}$" thick throughout on the surface near the barges.

The Chairman, Monghyr Municipality, received the information at 0.40 AM. on 3-3-1968

and reached the ghat. The Municipal Commissioner also came. The Chairman after inspecting the filter plant also saw a thick layer of sticky greasy oily substance. The Superintendent of Police, the Superintendent, Medical Hospital, the District Magistrate, the District Medical Officer of Health and the Executive Engineer, P.H.E.D. were informed.

The Chairman, Monghyr Municipality, contacted Sri Pandey, Head of the Department of Chemistry and called him for examining the oily substance. He came and took sample of greasy substance and reported that it contained petroleum products. The water supply was stopped.

On 3-3-1968 the District Magistrate visited the Water Works and made inspection of the filter plant. He also contacted Barauni Refinery and asked about the discharge. Then in order to trace the origin of the oily substance they decided to go upstream in a motor launch. Just at that time fire was noticed in the Ganges near Jamalpur Railway Barge.

Subsequently the Health Minister of Bihar Government and other officers made an aerial survey and found oil floating.

Heavier discharge of oil and oily waste took place before 2nd March, 1968.

1. Samples of effluent were taken.
2. Drums containing oil were found.
3. Log books were seized.

According to the Bihar Government:

1. Oil separators were not functioning; and
2. larger quantity of mineral oil and oily waste was discharged by the effluent pumping station into the pipe-line and finally into the river.

On occasions the percentage of oil and oily substance waste was alarmingly higher than the prescribed upper limit.

The break-down entailed considerable human suffering.

From 3-3-1968 to 9-3-1968 no water was supplied from the Water Works.

It admits the claim of the Monghyr Municipality for damages and has suggested certain preventive measures.

CHAPTER VI

POINTS THAT EMERGE FROM THE MEMORANDA OF MONGHYR MUNICIPALITY, BIHAR GOVERNMENT AND BARAUNI REFINERY

1. Monghyr Municipality draws raw water from the Ganges and after proper filteration at the Kasturba Water Works supplies water to the citizens of Monghyr.

2. Oily substance was found floating on the Ganges on 2-3-1968 at 8.30 PM and on 3-3-1968.

3. Some oily substance which was greasy and somewhat red and yellowish in colour was found floating in the storage tank and filter beds of Kasturba Water Works.

4. Strong smell of kerosene oil was coming from the storage tank and the filter beds of mechanical filter.

5. On the morning of 3-3-1968 the District Magistrate, Monghyr, visited Kasturba Water Works and inspected it and contacted the refinery authorities to know the cause of presence of oil at Monghyr. The refinery did not give satisfactory explanation.

6. Fire broke out in the Ganges near Jamalpur Railway Barge.

7. On the 4th March, 1968, the Chairman, Monghyr Municipality, the Municipal Commissioner, the Press Correspondent of Search Light and Sri Madhav Tanty, another Correspondent, went to Barauni Refinery and contacted the Deputy General Manager and questioned him about the discharge of oil and requested him to arrange for a jeep to go and see the discharge point.

8. On the same day the officers of the refinery inspected the effluent pumping station, the discharge point, the channel and the Kastaharni ghat and sent reports.

9. The Chairman, Monghyr Municipality, met some employees of the refinery who informed him that huge quantity of oil was thrown into the effluent pumping station from 23rd February 1968 and that one of the employees took him and the party to the effluent pumping station and there a ditch was found full of oil with intense smell of kerosene.

10. The same evening a truck bearing No. BRA 9725, with drums carrying oil was seen coming from the Ganges having ten big drums. The truck was stopped and the driver being questioned informed the Chairman that he was removing oil from about 11.30 AM. on the orders of the Electrical Engineer.

11. Water supply to the people of Monghyr town was stopped from the night of 2nd March to the morning of 5th March and being resumed for one day was again stopped till 9th March, 1968.

12. Samples of oil taken at various places.

13. In the afternoon of the 8th March, 1968, Sri Kumra, Chief Engineer, C.W.P.C., accompanied by Sri Balwant Singh, Sri Sahay, Chief Engineer, Public Health, Bihar Government, went to Monghyr. On the way the river was inspected at Chak village ghat, Khawa, Madnipur and Amarpur, where they found some traces of brownish patches of algae and grease soaked with oily scum somewhat little more concentrated right from the effluent channel down to Monghyr and lower down. They also noticed patches of algae mixed with oily scum along the bank and oil floating on the surface of the effluent channel.

14. On the afternoon of 9th March, Sri Kashyap, Chairman, Indian Oil Corporation, accompanied by Sri Kurien, an expert from the Indian Institute of Petroleum, Sri Balwant Singh, Sri Tripathi, Additional Chief Engineer, Public Health, Bihar Government, went to Monghyr and visited the Kastaharni ghat in-take, the Jamalpur in-take, the Water Works Filteration Station of Monghyr. At Kastaharni ghat and Jamalpur ghat some brownish oily scum soaked by algae and weeds was seen on the river bank. They also saw small patches of brownish scum floating near the barge at the Jamalpur Ghat.

15. Discussion on 9-3-1968 at the residence of the District Magistrate with the General Manager of the refinery and the Chairman, Indian Oil Corporation.

16. Minister of Petroleum came and inspected the site, at Monghyr and also visited Sector 6, the effluent pumping station besides other installations and put questions to the Operator and the Engineers.

17. Criminal case was lodged.

18. Contamination of river water at Monghyr.

19. Cause of contamination.

CHAPTER VII

DISCUSSION OF POINTS WITH REFERENCE TO THE EVIDENCE AND THE FINDINGS THEREON

1. The fact that Monghyr Municipality draws raw water from the Ganges and after proper filteration at the Kasturba Water Works supplies water to the citizens of Monghyr is not only admitted by the Bihar Government and the Barauni Refinery but is fully substantiated by the affidavits of the Chairman, Monghyr Municipality, Sri Misra (Ex. MM 1), the Executive Officer, Sri Bacha Prasad (Ex. MM 2), the Superintendent, Water Works, Sri Rajendra Narain Singh (Ex. MM 3), Sri Brajendra Kumar (Ex. MM 4), the complaint of Sri Brajendra Kumar to the Police (BG 2) and the oral testimony of Sri Misra.

2. Oily substance was found floating on the Ganges on 2-3-1968 at 8-30 p.m. and on 3-3-1968. Ex. MM 1—there was a continuous flow of oily substance through the Ganges and the whole Ganga was full of patches of thick layer of greasy substance and oil. Ex. MM 2—I saw that greasy and oily substance somewhat red and yellow in colour was floating in patches continuously in the Ganges. MM 3—oily substance was floating in the Ganges and strong smell of kerosene oil was coming; I also found layer of greasy substance about $\frac{1}{4}$" thick throughout the surface of the Ganges near and around the two barges. Ex. MM 4—the whole area was stinking with the smell of kerosene oil. Ex. MM 5—I also saw that a thick, red and yellow oily substance had accumulated around the barge on which water pumping station for Jamalpur town had been located; I also went to the barge of Monghyr Municipality at Kastaharni ghat and saw that oil was floating in water in profuse quantity and giving out smell of kerosene oil; patches of greasy oily substance red and yellow was also floating in the Ganges. Ex. MM 10—saw that red and yellow greasy substance was spread throughout the Ganges of 4" thick and was floating. Ex. MM 11—found that red and yellow fatty substance spread all around the barge; when I looked it closely I found that the substance was greasy and smelling like kerosene oil. Ex. MM 12—I saw that in the Ganges and around the boat red and yellow foam-like substance in sufficient quantity was floating on the 2nd and 3rd March—similar substance was spread on the surface of water around our barge. Ex. MM 13—I saw red and yellow fatty substance was floating at the surface of the water hill of the mechanical filter and flocculator. Ex. MM 20—on inspection of the Water Works I saw that red and yellow greasy substance was floating over the water and the entire tank was smelling like kerosene oil. Ex. MM 21—saw that some oily substance was floating at the surface of the river water and at the bank some red and yellow greasy substance was spread. Ex. MM 22—some greasy substance of red and yellow colour was spread there which was smelling like kerosene oil. Ex. MM 23 and MM 24—saw that red and yellow oily substance smelling like kerosene oil was floating at the surface of the Ganges. Ex. MM 27—on 3rd March, 68, when I went for bath in the Ganges in the morning at Babu ghat I felt kerosene oil smell coming. Ex. MM 28—I felt the smell of kerosene oil coming from the water on 3-3-1968 when I had gone for my bath in the Ganges. Ex. MM 29—on 3-3-1968, while I had gone to the ghat to take bath I found that kerosene oil like smell was coming. Ex. MM 30—found that oily substance, brown and yellowish in colour was spread over the surface of the river which was smelling very badly and also like kerosene. Ex. MM 31—fish brought out from Ganga were smelling like kerosene. Ex. MM 32, MM 33, MM 35, and MM 36 (fishermen)—fish brought out from Ganga were smelling like kerosene; oil like substance, brownish, yellowish and waxy was found floating on the surface of the water. BG 1 and BG 2—there was a continuous flow of oil on the entire surface of Ganges water and there were yellowish foams of greasy matter floating on the surface. BG 3 and BG 4—found kerosene oil, petroleum silt in the Ganges on 3-3-1968. BG 5—I immediately went to Water Works and found that oily substance and also yellowish greasy substance was floating on water and there was a stink similar to that of kerosene oil. BG 6 and BG 7—found patches of oily and greasy floating materials on the surface of water of river Ganges in a long stretch. The oral testimony of Sri Misra, MMW 1 at pp. 7-8(ER) and Sri T. S. Rao, GW 10, at pp. 937 and 938 (ER) are also to the same effect. The refinery in Appendix H to the Memorandum and in its counter-affidavit has said that some substance like oil was found floating which was reddish and yellowish in colour. It has also supplied photographs of Jamalpur and Monghyr water pumping barges taken by them which clearly show oily accumulation—see plates 1, 4 and 5. All this shows that it has not denied it. This fact can be held as proved. (For photos see Appendix XV).

3. Some oily substance which was greasy and somewhat red and yellowish in colour was found floating in the storage tank and filter beds of the Kasturba Filter of the Water Works.

4. In support of this there are the affidavits—Exs. MM 1, MM 2, MM 3, MM 13, MM 14, MM 18, MM 19, BG 1, BG 2, BG 5, BG 6, BG 9 and the oral testimony of Sri Misra, MMW 1, Sri Tuli CW 3, p. 335-336(ER), Sri T. S. Rao, CW 10, p. 937-938(ER), Sri Hajela, CW 12, at p. 1127(ER).

MM 1: Found that a thick layer of sticky greasy oily substance about $\frac{1}{4}$" thick on the surface of the water hill and filter beds.

MM 2: I at once went to the mechanical filter and saw that some oily substance which was sticky greasy and somewhat reddish and yellowish in colour was floating in the storage tank and filter beds of the mechanical filter.

MM 3: I inspected the filter beds, water intake point and the water hill of the mechanical filter and found that some oily substance which was greasy and somewhat reddish and yellowish in colour was floating in the water hill and filter beds of the mechanical filter.

MM 13: On 3-3-1968 when I came on my duty at 10 p.m. in the night then I saw that red and yellowish fatty substance was floating at the surface of water hill of mechanical filter and flocculator.

MM 14: On reaching near filter found that oil was spread every where in filter bed, flocculator and water hill.

MM 18: At night I saw that slow sand filter mechanical filter, settling tank and underground reservoir every where a type of red and yellow oily substance was floating over the surface of the water and was strongly smelling like kerosene oil.

MM 19: Bad smell of kerosene was spreading all round and something reddish and yellow oily substance was floating over the surface of the water of each tank and filter.

BG 1: From there I went to Kastaharni intake pumping station of Monghyr Municipality. There also I saw that oil was floating round the barges and the same yellowish greasy substance in the shape of foam was floating on the surface.

BG 2: After arriving at Monghyr I went to Kasturba Water Works and found similar conditions in the filter beds and storage tank of the Water Works. From there I went to Kastaharnighat in-take pumping station of Monghyr Municipality. There also I saw that oil was floating round barges and the same yellowish greasy substance in the shape of foam was floating on the surface.

BG 5: I immediately went to Water Works and found that oily substance and also yellowish greasy substance was floating on water and there was a stink similar to that of kerosene oil.

BG 6: I went to the filteration plant of Monghyr Municipal Water Works where plant was idle and found the same oily and greasy floating materials on the surface of different units of the plant.

BG 9: I at once went to the Water Works (Monghyr) and found that oily greasy substance was floating over the water of mechanical filter and clarifier.

MMW 1: On being questioned by the Chairman said (p. 7-ER): "I came to the Water Works at about 1 O'clock on the 2nd March (technically it will be 3rd March) and when I inspected the mechanical filter beds and the water hill I found that it was full of oil and intense smell of kerosene oil thing was coming. Besides this oil and smell there was a thick layer on the surface of the water of the filter and it was somewhat reddish in colour and the same thing I saw in the oil separator of the Barauni Oil Refinery."

In cross-examination by Sri Baldeo Pershad Singh he says at p. 17-ER:

"In the night, first I went to the mechanical filter beds and I first inspected them and after inspecting that and phoning to Mr. Pandey thereafter I saw the slow sand filters also."

Q. In those belts did you see oily, sticky, greasy red patches?

Ans.: There was a film of greasy, reddish substance. It was not in patches.

CW 3: Sri Tuli at p. 335(ER) on the questions in cross-examination by Sri Misra (Chairman, Monghyr Municipality) says:

Q: You saw with your eyes film of oil on the water surface of these filters:

Ans.: Occasional film of oil.

Q: What did you mean by occasional film of oil?

Ans.: The specs of oily patches at the surface.

Again at page 336(ER) he was further cross-examined.

Q: There was a faint smell of petrol.

Ans.: Correct.

Q: This was like kerosene oil smell?

Ans.: Something like kerosene oil.

Q: Was it a pungent smell of kerosene oil?

Ans.: No.

Q: ATF smells like kerosene oil?

Ans.: Something similar.

CW 10: Sri T.S. Rao at p. 937(ER) on a question put in cross examination says: "oily mass was floating on the surface of water."

CW 12: Sri Hajela at p. 1127(ER) denies having seen oil in the reservoir but has noticed some colour band film on water flowing from mechanical filter occasionally. In his report along with Sri Tuli and Sri Ramamurthy dated 5-3-1968, appendix D, Annexure to the Barauni Refinery Memorandum he has mentioned that there was very faint smell of petroleum products in the raw water being received at the water treatment plant.

This fact is also admitted by the Bihar Government and not denied by the refinery. It can, therefore, be easily held as proved.

4. Strong smell of kerosene oil was coming from the storage tank and the filter beds of mechanical filter—Exs. MM 1, MM 2, MM 8, MM 9, MM 10, MM 11, MM 12, MM 13, MM 14, MM 15, MM 16, MM 17, MM 18, MM 19, MM 21, MM 22, MM 23, MM 24, MM 27, MM 28, MM 29, BG 8, BG 9, MMD 1, MMD 2, MMD 5, MMD 9, MMD 15, and MMD 27.

MM 1: Found that smell of kerosene oil was coming from the storage tank and the filter beds of mechanical filter.

MM 2: Superintendent, Water Works, informed me that smell of kerosene oil was coming from the storage tank. He also told me that Pump Attendant at Kastaharnighat pumping station had informed him on telephone that ... smell of kerosene oil was coming.

MM 8: The atmosphere was filled with the smell of kerosene like substance.

MM 9: At the surface of river brown and yellow oily substance smelling like kerosene and shining was floating.

MM 10: Saw that yellow and greasy substance was spread throughout Ganges ... It was strongly smelling like kerosene oil.

MM 11: When I looked it closely I found that the substance was greasy and was smelling like K. oil.

MM 12: While we were throwing water from boat then we felt smell like kerosene oil.

MM 13: Red and yellow fatty substance ... was smelling like kerosene oil.

MM 14: Oil was spread every where in filter bed ... and it was smelling very badly like kerosene oil.

MM 15: I was throwing from boat the excess discharge water ... I felt kerosene oil smell.

MM 16: I work as filter attendant ... I felt kerosene like smell.

MM 17: Yellow fatty substance spread over the surface ... was smelling like kerosene oil.

MM 18: I went upon the barge of Municipality ... kerosene like smell was coming.

MM 19: Bad smell of kerosene was spreading all around.

MM 21: I put some water into my mouth ... I felt as if it was wholly kerosene oil.

MM 22: I found that K. oil was floating heavily at the surface of the water.

MM 23: The atmosphere in the vicinity was badly smelling like kerosene oil.

MM 24: Red and yellow oily substance smelling like kerosene oil was floating at the surface of Ganges.

MM 27: I felt that kerosene like smell was coming.

MM 28: I entered into the water; my whole body started smelling like kerosene oil.

MM 29: I entered into the river; my whole body started smelling like kerosene oil.

BG 8: The substance was thick greasy of dark colour and was smelling of kerosene oil.

MMD 1: Letter from Sri Bacha Prasad, Executive Officer, Municipal Board, Monghyr to the Senior Executive and Medical Officer, Monghyr, dated 2-3-1968: "just now it has been learnt that in Ganges river some substance like kerosene oil is floating in the main current and it has a smell like kerosene oil...".

MMD 2: Report of Mr. I. D. Pandey, Head of the Chemistry Department, R.D.&D. College, Monghyr, dated 3-3-1968 to the Chairman, Monghyr Municipality: "the sample of water... was analysed ... found to contain petroleum products."

MMD 5: Report of Executive Officer, Monghyr Municipality, to the Chairman, Monghyr Municipality: "On 2-3 1968 at 9.00 p.m. the Water Works Superintendent informed me that from the storage tanks of the mechanical filter, smell was coming like kerosene oil.

MMD 9: Letter from Sri S. N. Hashim, Health Minister to the Chief Minister,

Bihar, dated 9-3-1968 : "near Kastaharnighat I found kerosene oil and petroleum silt in a large quantity and elsewhere in the Ganges in smaller patches on the up-stream."

MMD 15: Letter of the Chairman, Monghyr Municipality, to Sri Ashok Mehta, Minister of Petroleum, dated 7-3-1968 : "I myself went to the river side around the two barges ... oily greasy substance ... was floating ... and it had formed a layer about $\frac{1}{4}$" thick ... and it was smelling like kerosene.

MMD 27 : Log book of In-take pumping station of Kastaharni Ghat dated 2-3-1968 : "it is giving very bad smell like kerosene oil." This fact not being denied either by the Bihar Government or the refinery can be held to be proved.

5. In the morning of 3-3-1968, Sri Binod Kumar, I.A.S., District Magistrate, Monghyr, visited the Kasturba Water Works and made inspection of the Water Works including the mechanical filter. He contacted the refinery authorities who denied and discharge of petroleum products into the Ganges and did not give a satisfactory explanation. To support this fact the Monghyr Municipality has filed Ex. MM 1 and has examined Sri Misra. The Bihar Government has filed Ex. BG 5, the affidavit of the District Magistrate, which also supports this statement. The refinery while admitting that the District Magistrate contacted the refinery authorities denied that the authorities gave an evasive reply and stated that what all they said was that no free oil was ever allowed to enter into the Ganges. In the face of the positive statement contained in the affidavit of the District Magistrate supported by the affidavit of the Chairman, Monghyr Municipality, Ex. MM 1 and his oral testimony, the Commission is not prepared to accept the version given by the refinery authorities about the replies.

6. Fire broke out in the Ganges near Jamalpur Railway Barge on the banks of the river Ganges. In support of this there is the affidavit of the Chairman, Monghyr Municipality, Ex. MM 1, while we were on the motor launch fire broke out in the Ganges near Jamalpur Railway Barges. MM 3—there was a fire in the water near barge pontoon of Jamalpur Railway; saw a huge quantity of black smoke in the Ganges near Kastaharnighat. Ex. MM 20 (Member, Municipal Board, Monghyr)—at about 1.30 p.m. I saw thick column of smoke coming from Ganges side and great rumour spread in the town that fire had taken place in the Ganges. On listening this unusual incident I also proceeded the side to see it. On reaching there I saw that at the bank of the river Ganga where water in-take station of Eastern Railway, Jamalpur, is situated, in its barge and around it fire had broken out in the bank of the river and persons of fire brigade were busy in extinguishing it. Ex. MM 22—that at about 1.30 p.m. I saw from the roof of my house that a thick column of black smoke was rising from near Kastaharnighat. At the time a rumour spread in my mohalla that fire has broken out in the river Ganges. I saw the fire brigade rushing, then I also proceeded towards the site and reaching there I found that fire brigade was busy in extinguishing fire which had caught a portion of the Jamalpur barge. Ex. MM 23 (officer in the fire brigade service)—I was informed from telephone No. 21 that fire has broken out in and around the Jamalpur Eastern Railway Barge in the water at Kastaharnighat. On getting information, I along with other men went there and were engaged in extinguishing fire. BG 1 and BG 2—saw signs of fire near the barges. BG 9—I had to come down along with the Superintendent, Water Works, from the launch on 3-3-1968 in the afternoon because fire was going on over the surface of the Ganges water near the Railway pumping boat ... the fire brigade people arrived there and extinguished the fire. BG 10—as a result of fire crops of barley and wheat caught fire in village Jagatpura. BG 15—on 5-3-1968 at 11.30 a.m. fire broke out suddenly near the pipe through which the water of the refinery flows in the Ganges. The oral testimony of Sri Misra (witness on behalf of the Monghyr Municipality, MMW 1) who says while I was in the mid-stream of the Ganges I saw fire near Jamalpur Railway Barge; Sri Maheshwari Pershad (witness on behalf of the Monghyr Municipality—MMW 2) who says he saw the fire at 1.30 p.m. ... some portion of the barge was in fire. CW 5, Sri Kurien say : "at the barges there was a fire ... there was a tree very near the barge, the leaves were partly burnt, CW 6, Sri Balwant Singh, on a question by the Chairman, said: "there was singeing on the top of the tree and there was charring in a corner ... the leaves of the trees were somewhat blackish and Sri Hajela, CW 12, who says : "on the tree near the barge some of the green leaves had become black and there was little charring of the plant that was put between the barge and the bank; BG 5, affidavit of the District Magistrate lends support to this statement. The refinery has not denied this fact in para 10 of their counter. This fact also can be held as proved.

7. On 4th March, the Chairman, Monghyr Municipality, accompanied by the Municipal Commissioner, the Press Correspondent of Search Light, Sri Kasi Prasad and the Press Correspondent of Hindusthan Samachar, Sri Madhav Prasad Tanty, went to Barauni Refinery, at about 4.00 p.m. and contacted Sri Harnal, Deputy General Manager and asked him about the discharge of oil. Sri Harnal flatly denied to have discharged any oil beyond the permissible limits and stated that the dealer of oil products might have thrown out oil into the

Ganges or the Bata people might have thrown some refuse. In support of this there are the affidavits MM 1, MM 7 and MM 8 and the oral testimony of Sri Misra. The refinery has denied that Sri Harnal had made that statement and stated that what all he said was that the discharge of oil from the refinery was not normally beyond permissible limits. Sri Harnal in his affidavit does not make mention of this fact at all. In the face of the positive statements, MM 1, MM 7, MM8 and the oral testimony of MMW 1 and there being no mention of this fact in the affidavit of Sri Harnal, the Commission has to accept the version of the Monghyr Municipality.

8. On the 4th March, Sri A. K. Biswas, Division Head on Shift Duty, checked the effluent water pumping station and the discharge point and gave report—Appendix 'A' to the Memorandum of Baraunni Refinery. On the same day, Sri Tuli, Sri Hajela, Sri Ramamurthy and others visited Kastaharnighat and the river at Monghyr and sent a report—Appendices D and E. On the same day in the afternoon Sri T. S. Rao, Assistant Engineer (Public Health) inspected the channel and reported to the Deputy General Manager (Technical) and the Chief Electrical Engineer to the effect that the effluent channel cut in the river bed was found to be flowing but some dark patches of oil along the channel at places were observed. Accordingly he sent a report on 12-3-1968—Appendix C. This fact of inspection of various sites of pollution is admitted by the Monghyr Municipality and proved by the evidence of Sri Tuli and Sri Hajela. On 5-3-1968, the Deputy General Manager (technical) accompanied by Sri C. D. Avyar, Chief Electrical Engineer reached village Chawk at about 10.00 a.m. after walking the distance of 4 miles ... While the main stream of water is said to have appeared to be free from oil, patches of oily material and sludgy stuff were observed near the banks at a number of places. The refinery authorities in reply to the questionnaire issued by the Commission has supplied photographs of the effluent channel as it was existing in May 1968 — for reference see plates 1 and 2 (photo Ex. 16 and 21). These photographs clearly show the presence of dark oily patches on the sandy bed.

9. The Chairman, Manghyr Municipality, met some employees of the refinery who informed him that huge quantity of oil was thrown into the effluent pumping station from 23rd February and that one of the employees, took him and the party to the effluent pumping station and there a ditch was found full of oil and intense smell of kerosene was felt. He also inspected the pumps and wells and found them full of oil and not water. Samples were taken by the Chairman, Monghyr Municipality. The Pump Attendant on duty told him that from 23rd February onwards oil had been pumped and entries were made in the log books. Meanwhile Sri Harnal and Sri Saigal who arrived there and were shown oil in the ditch and pumps of the effluent pumping station looked bewildered. In support of it there is MM 1, the affidavit of the Chairman, Manghyr Municipality and his oral testimony. The fact that huge quantity of oil was discharged; that log books were seized; that sample was taken; get support from the evidence of Sri Ram Sudhist Kumar, CW 1, witness for the Commission. He is an Operator in the refinery and referring to the entries made by him he deposes that "from 23rd onwards huge quantity of oil was discharged; that log books were seized and that sample were taken." As against this witness great criticism is levelled by the Baraunni Refinery lawyer which will be discussed later on when we refer to his evidence, relating to the entries in the log books.

10. The same evening, *i.e.,* on 4-3-1968 at about 6.00 p.m. a truck bearing No. BRA 9725 was seen coming from the Ganges side having ten big drums. The truck was stopped and the driver on being questioned informed the Chairman, Monghyr Municipality, that he was removing oil from abont 11.30 a.m. on the orders of the Electrical Engineer, Sri Bishupad with the help of the Sanitary Engineer and sweepers. He also said that oil was taken out by buckets from the wells of the effluent discharge pipeline running to the Ganges in the presence of Sri Harnal and Sri C. D. Ayyar, Chief Electrical Engineer. Here also the Chairman, Monghyr Municipality, took sample of the oil. In support of this the Chairman has given his affidavit, MM 1. The refinery authorities have totally denied this fact. The Disrict Magistrate in BG 5 supports this statement of the Chairman, Monghyr Municipality, MM 1, and his oral testimony as MMW 1 who says that on being informed by the Chairman, Monghyr Municipality, he, accompanied by the Municipal Commissioner, reached the effluent pumping station, the next day on 5-3-1968 and inspected the detained truck containing drums and took samples from the Chairman. He also went by jeep by the side of the effluent discharge pipeline to the river where he found large pools of oil near several valves. This is further supported by the evidence of CW 1. The refinery only stated that no samples were taken in their presence without referring to the other incident of the truck being detained containing barrels of oil. The fact of truck being found with ten drums and detained can therefore be held to be proved. The other fact that oil was taken out by buckets from the wells of the effluent discharge pipeline running to the Ganges is spoken to by MMW 1 in his oral testimony and his affidavit, MM 1, the affidavit of BG 5, the District Magistrate. MMW 1 says: "in the presence of CW 8, he asked CW 6 why your people were removing the oil and he told me that was foolish on their part." CW 8, the

Minister, when asked whether in his presence he (MMW 1) asked CW 6 why they were removing oil stated that this question did come up and there was discussion at that time why oil was removed and the explanation given was that there was too much accumulation of it and that they removed it. He says further that he did not consider that explanation as satisfactory. On a further question by Sri Misra, Advocate, whether CW 6, used the words "it was rather foolish" on their part, CW 8 stated that the word he said may be 'foolish' and I am not in a position to contradict. CW 6 when asked whether the statement given on oath by MMW 1 was correct, stated that that statement was not correct and added that when the Minister asked why that truck was coming with oil he explained to him how the oil can accumulate in the chamber and they were trying to remove it. He further stated thus: "possibly in the situation where atmosphere was surcharged with rumours and suspicion having arisen against the refinery and the people were going about investigation, it was foolishness on the part of some one to have started cleaning the chambers."

On a further question "so that statement is correct" he stated: "while the police is around, and you try and take out oil for whatever good reason, it was bound to be considered incriminating; if you want to do it you could easily associate the police by explaining to them that it is a fire hazard and that any fire will be disaster in the refinery and we are scooping out the oil. But they got it in drums and they were trying to remove it. I call it foolishness their not having knowing how the administration works. In their anxiety to safeguard the refinery they were doing that in good faith."

BG 5, the affidavit of Sri Vinod Kumar, District Magistrate, Monghyr: in this regard is in the following words: "at the effluent pumping station there was a truck containing 10 drums ... the rumour around there among the labourers or the general public was that several wagons had been loaded wrongly and since the contents could not be taken back into storage tanks those wagons had been suddenly emptied out resulting in large flow of oil into the river. Another rumour was that one of the large storage tanks containing inferior type of oil has been suddenly emptied out to make space for a superior type of product because no other storage was available.

Further in the affidavit, Sri Vinod Kumar refers to the explanation given by the Deputy General Manager, Sri Harnal, thus: "the Deputy General Manager denied both the above rumours or wrong loading of wagons and sudden emptying of inferior type of oil from any tank. He said ... his own view was that the only possibility could be that after the effluent is discharged from the pipe on the river bank there is a large sandy stretch through which it flows before it meets the main stream of water. Because in that season the river is low it was possible that somewhere the flow had got blocked over a considerable period so that the water portion had seeped into the ground leaving very concentrated oily liquid which at some stage become sufficient to break through the blocking sand and thus resulting in a sudden discharge of oily and greasy substance in large quantity into the river. As regards the oil found in the effluent pump and at the valves at the effluent discharge pipe, the Deputy General Manager said that because oil floats on the surface of the water a little oil goes into the top portions of these structures but that did not imply that what was being discharged into the river was concentrated oily mixture.

In the explanation given to the District Magistrate by the Deputy General Manager there is no reference to the removing of oil in the drums and kept in the truck. The statement on oath given by Sri Misra, MMW 1, not only gets support from the evidence of CW 1, CW 6, CW 8 but also from the affidavits, MM 1 and BG 5. The explanations given by Sri Harnal referred to in BG 5 and the statement of Sri Harnal contained in his affidavit do not rebut it.

During the examination of MMW 1 and MMW 3 certain questions were put to them by the learned lawyer for the refinery in cross-examination which indicated that the lawyer wanted to show that due to fire hazard the oil was being removed. But when his attention was drawn to the fact that in the memorandum filed by the refinery this stand was of removing the oil for fear of fire hazard had not been taken up, the learned lawyer could not give satisfactory reply. But this stand was again taken up during the course of arguments and contended by the learned lawyer for the Barauni Refinery that for fear of fire hazard scumy sludgy material was removed from the chambers. To the same effect is the statement of Sri Harnal in the affidavit filed by him on 1-4-1969 in reply to the question issued by the Commission. By question No. 11 he was asked as to what he had to say about the allegation of the Monghyr Municipality that on 4-3-68 a truck No. BRA 9725 driven by Sri Ram Mohan Tiwari was carrying ten drums containing oil which was being removed from 11.00 a.m. from the valves of the effluent discharge pipeline running to the Ganges and that the oil was being removed under your instructions and that he and Sri Ayyar, Chief Electrical Engineer, were present for some time during removal of oil? In answer to the above he stated in his affidavit dated 1-4-1969: "Sri V. B. Hajela was instructed by me to visit the point of out-fall on the 4th

morning and he so accompanied by Sri S. N. Jha, Engineering Assistant, Grade I, while going to the river Ganges saw accumulation of sludgy/mucky/watery effluent in and around the valve chambers. ... I asked Sri Ayyar that arrangements should be made for immediate removal of the material as it was a potential fire hazard. ... From the above points it is obvious that before I could give instructions for removal of the material, Sri T. S. Rao had already arranged for it. I was very much pleased to find out on my inspection while returning I saw the trucks along with drums parked by the side of one of the chambers and the oily sludgy/mucky/watery material was being removed. I again emphatically emphasised that the material collected was not oil, but oozings of the air relief valves which get concentrated and accumulated on the earthen bottom of the valve chambers." In the memorandum and in the counter-affidavit of the refinery there is no mention of removal of oil in drums due to fire hazard and it was only during the cross examination of MMW 1 and MMW 3 and in the written arguments that the lawyer for the refinery tried to bring out this case.

But the only evidence that is placed on record is the solitary affidavit of Sri Harnal dated 1-4-1969 on a questionnaire issued to him by the Commission wherein he has referred to fire hazard as the reason for the removal of oil. It is, therefore, clear that the plea of fire hazard is an after-thought. After this what has to be seen is whether what was removed was oil from the valve chambers on the effluent discharge pipeline or sludgy, scumy material, for which we have to refer to the report of the analysis of the samples taken.

The analysis of the sample (IIP report) OD-3 and sample No. R 0341/16 showed that it contained 48.5 per cent oil and 51.5 per cent water. There was no sludge in the sample supplied. It is, therefore, apparent that the material collected in the drums was a mixture of oil and water and did not contain any substantial quantity of scumy or sludgy material. If the effluent passing through the pipeline contained only 50 ppm. oil as contended by the refinery it would be almost impossible for so much oil to have collected on the surface of the effluent and leaked through the air valves into the valve chambers. This shows that the oil content of the effluent must be much more than 50 ppm. prior to the leakage into the value chambers. This does not, however, rule out the possibility of sludgy and scumy material having accumulated in the valve chambers.

11. The fact that water supply to the people of Monghyr was stopped from the night of 3rd March till the morning of 5th March and being resumed for one day it was again stopped till the 9th March is proved by Exs. MM 1, MM 2, MM 3, MM 4, MM 8, MM 9, MM 29, MM 34, MM 37, BG 2, BG 5, MMD 8, MMD 26, MMD 27, MMW 1, CW 10, Sri T. S. Rao.

MM 1: On 3-3-1968 at about 2.30 a.m. in the night in consultation with the Executive Officer and Sri S. K. Sinha, Municipal Commissioner, I ordered water supply to the town to be stopped for indefinite period and people were informed of the decision by announcement on loud-speaker from about 3.30 a.m. The people were also advised not to drink Ganges water. ... From the morning of 5-3-1968 pumping of water was resumed to get the distribution mains flushed and also for sanitary purposes but the people were instructed not to drink Ganges water by announcement on loud-speaker. On 6-3-1968 at about 6.00 p.m. when the Executive Officer and the Superintendent, Water Works, were inspecting storage tank of the mechanical filter they found that again oily substance like oil was floating in the water ... Sri T. S. Rao of Barauni Refinery was present in the Water Works. He had come to see the Water Works, I was informed. The Health Minister was informed over phone and the pumping of water was stopped. People were also informed by loud-speaker. On 7-3-1968 also the condition remained the same. The District Magistrate was requested to get the discharge stopped. On 8-3-1968 the Health Minister again visited the Water Works and held a discussion with me, the District Magistrate, the Civil Surgeon and Superintending Engineer, PHED, Monghyr, to start installation of hand pumps immediately and he asked the Chief Engineer, PHED, Patna, to send trucks with tankers to supply drinking water to the people of Monghyr. ... On 9th morning ten trucks with tankers arrived from Patna and drinking water supply was started by tanking water from private tube wells. On 8th and 9th the storage tanks of the mechanical filter, its filter beds, flocculator and under-ground reservoirs were partially flushed and cleaned and treated with bleaching powder and on 9-3-1968 water supply was again resumed from 4.00 p.m. The people were informed to drink the water supplied after boiling it for 15—20 minutes.

MM 2: On 3-3-1968 at about 2.30 in the night the Chairman, in consultation with me and Sri Satish Kumar Sinha, Municipal Commissioner decided to stop water supply to the town for indefinite

period. People were informed of the decision by announcing this by load speaker. ... People were also advised not to drink the Ganges water. On 9-3-1968 in the morning 10 trucks with tankers arrived from Patna and drinking water supply to the people was started by tankers. ... On 8-3-1968 and 9-3-1968 the storage tank of the mechanical filter, its filter beds, flocculator and underground reservoir were partially cleaned and treated with bleaching powder and on 9-3-68 water supply to the town was again resumed from 4.00 p.m. But the people were constrained by loud-speakers not to drink water. From 10-3-1968 people were advised to use water for drinking purposes only after boiling it for 15 minutes.

MM 3: On 2-3-1968 I ordered the Pump Attendant to keep the pump stopped till further orders. ... At about 11.00 p.m. we returned to the water works. The Chairman, Sri Misra, was contacted on phone ... The Executive Officer informed the Chairman of what had happened at 12.40 in the night and the Chairman reached Water Works at about 1 o'clock in the night. Before arrival of the Chairman, the Municipal Commissioner had arrived in the Water Works ... The Chairman ordered at about 2.30 a.m. that water supply to the town will remain stopped for indefinite period ... On 8-3-1968 Mr. M. M. Hashim, the then Health Minister, Government of Bihar, visited the Water Works and ordered the Superintending Engineer, PHED, to start installation of 25 hand pumps in the town immediately. On 8-3-1968 and 9-3-1968 water hill, filter bed, flocculator and underground reservoir were partially flushed, cleaned and treated with bleaching powder and on 9-3-1968 evening at 4.00 p.m. the people were informed on microphone not to drink it without boiling for 15—20 minutes.

MM 4: On the early hours of 3-3-1968 the Monghyr Municipality announced through loud-speaker the suspension of water supply due to pollution of Ganga water and contamination of its filter beds with kerosene oil substance. The suspension of water supply by the Monghyr Municipality continued for many days.

MM 8: Announcement was made on behalf of Chairman and the Superintendent, Water Works, regarding the indefinite suspension of water supply in the town.

MM 9: On 3-3 1968 when I returned home the supply of water was stopped. ... My school and other schools of town were working only half day as there was no water for the students to drink. ... The Municipality again started water supply but that water was smelling like kerosene.

MM 29: On 3-3-1968 the Municipality stopped the supply of water. For ten days I had to bring water on rickshaw.

MM 34, MM 37: Water supply to Monghyr was stopped because oily substance like kerosene was found floating on the surface of the river Ganga.

BG 2: On the morning of 3-3-68 I was informed by the then L.S.G. Minister that water supply of Monghyr town had been disrupted and that Ganges water had been polluted by some oily substance ... On 8-3-68 Secretary, PHED, ordered that the trucks with 400 gallons GI tanks should be sent immediately to Monghyr to supply drinking water. Ten trucks were sent and they supplied drinking water to the people of Monghyr till 13-3-1968. ... On order of the Health Minister on 8-3-68 to Executive Engineer, PH Division, Monghyr, 25 hand tube pumps were installed in Monghyr town as an emergency measure. ... Drinking water supply to the Monghyr town remained suspended from 3-3-68 to 9-3-68 and from 10-3-68 the people were advised to drink water after boiling for 15—20 minutes.

BG 5: On 3-3-68 I learnt that pumping of water from river Ganges at the Kastaharni Ghat, Monghyr, had been stopped because large quantities of oily substance was found ... floating on water ... when the water appeared to have become somewhat cleaner pumping in the town system was also done from the morning of 5th March in order to clean up the town pipeline distributing main. However, as water was not fit to drink the people were warned by loud-speaker not to use that water for drinking or cooking purposes. ... From the evening of 6th March pumping stopped because some oily patches were found on the water. It was again to be cleaned up ... On the 9th afternoon water was again pumping into tanks and reservoirs of Monghyr water works and supply to the town was started from 5 p.m. on 9-3-68 ... However, as it was considered desirable to wait for a report on the sample the people were advised not to use water for drinking unless it was boiled for 15—20 minutes. On the 9th morning ten trucks with 32 tanks sent

by Public Health Engineering Department from Patna also arrived and water for drinking was supplied to people in the town through these trucks. This was continued until 13-3-68 when the situation returned to normal.

BG 9: At about 3.00 p.m. on the night of 2/3-3-1968 the Store Chowkidar informed that the pumping was stopped on account of oily substance ...

MMD 26: Log book of mechanical filter of Kasturba Water Works: "Entry dated 2.3.68: "To-day, on 3-3-68 there was no supply of water from Kastaharnighat, Mechanical filter, as the water in the river Ganges was polluted with oily substance; there was no supply of water from the ghat as the mechanical filter remained closed."

MMD 27: Log book of in-take pumping station of Kastaharnighat, entry dated 2-3-68: "Received information on telephone from Md. Wasim that something like oil is floating in the Ganges. At once came to in-take spot along with Executive Officer and ordered him to stop pumping process till further order because actually thick layer of some oily product is floating in the Ganges and it is given very bad smell like K. oil. ...

Para 7 of the Memorandum of Monghyr Municipality: On receiving the telephonic information the Superintendent, Water Works, rushed to the Rapid Gravity Filter Plant and on inspection found that some oil substance which was greasy and somewhat reddish and yellow in colour was floating in the storage tank and filter beds of the mechanical filter. He also found that smell of K. oil was coming from them.

Para 8 of the Memorandum of Monghyr Municipality: Thereafter he informed the Executive Officer, who lives inside the Water Works Compound. The Executive Officer inspected the Rapid Gravity filter along with the Superintendent, Water Works, and found the report of the Superintendent correct. They ordered the filteration to remain stopped.

Para 9 of the Memorandum of Monghyr Municipality: After the inspection of mechanical filter both the Executive Officer and the Superintendent rushed to Kastaharnighat in-take pumping station. ... They ordered the pump Attendant to keep the pumping stopped till further orders.

Para 29 of the Memorandum of Monghyr Municipality: On 3-3-68 and 4-3-68 the foot valve of the in-take pumping station was lowered to 6' on the advice of PHED authorities and from the morning of 5-3-68 pumping of water was resumed to get the distribution mains flushed and also for sanitary purposes and also to flush the rising mains and storage tanks. But the people were instructed not to drink the water by announcement on loud-speaker.

Para 31 of the Memorandum of Monghyr Municipality: The Chairman was informed and he at once came to Water Works and he informed the Health Minister on phone and stopped pumping and water supply. People were informed by loud-speaker, on 7-3-68 in the morning also the condition remained the same. ...

Para 2 of the Memorandum of Bihar Government: On 2-3-68 at about 8-30 p.m., Md. Wasim, Pump Attendant, informed Sri Brajendra Narain Singh on telephone that oily substance was flowing in the Ganges and he stopped pumping of water.

Para 3 of the Memorandum of Bihar Government: After the inspection of mechanical filter both the Executive Officer and the Superintendent Water Works, rushed to Kastaharnighat in-take pumping station. ... They ordered Pump Attendant to keep the pumping stopped till further orders.

MMW 1: (p. 7-ER) Sri Misra: But even before the report was received I thought it was wise to stop the water supply to the town because even a lay man could see that it was k. oil something dangerous to the health of the people and, therefore, in the night I took a decision that water supply to the town will remain suspended for an indefinite period and this was announced by loud-speaker in the dead of the night and people were also asked not to drink Ganges water because it was polluted.

CW 10: (questioned by Sri Misra p. 937-ER): You made inquiries and learnt that water supply to Monghyr town was stopped on 3rd and 4th and on 5th morning it was resumed for washing purposes only:

Ans.: I came to learn that water supply had been started for purposes other than drinking.

This fact is not specifically denied. It can be held as proved.

12. Samples of oil taken at various places is proved by MM1, MM2, MM3, MM5, MM7, MM8, MM14, MM15, MM25, BG2, BG5, BG7, BG12, BG14, MMW1, CW1 and CW10.

MM 1: It is learnt that the Inspector of Factories, Monghyr Circle, Sri Maheshwari Pershad accompanied by Dr. D.P. Banerjee, Medical Inspector of Factories, Bihar and Mr. M. K. Roy, Chemical Inspector of Factories, Bihar, inspected the refinery on 6th and 7th March and took samples of discharge of effluent from 3 points for analysis. ... The first sample was taken just after the effluent was coming from Guard Basin I, the second was taken from the drain leading to effluent pumping station and the third was taken at the point of discharge.

MM 2: Samples of water were taken on different dates from 5th March onwards by sample taker for chemical and bacteriological analysis.

MM 3: Samples of water were taken from river Ganges and Water Works and Public Hydrants on 5-3-1968.

MM 5: Samples of effluent oil coming from the following points were taken: (1) just after the effluent was coming from guard basin No. 1; (2) from the drain leading to sewage pumping station; and (3) at the point of discharge in the dry river.

MM 7: The Chairman took the sample of oil from one of the pumps ... The Chairman handed over both the samples which he had collected from effluent pumping station and the truck.

MM 8: The Chairman took sample from one of the pumps.

MM 14: The Chairman, the Executive Officer and the Superintendent, Water Works, moved along with Sri Pandey of RD & DJ College and collected samples of water from the Water Hill.

MM 15: That on 8-3-1968 between 9.00 and 9.30 hours the motor was started under the order of Superintendent, Water Works. Two persons from Barauni had come to take samples of water. I obtained their endorsement in the log books.

MM 25: I collected the samples of this water in clean bottles according to rules in the presence of witnesses and sealed it properly, pasted labels and kept carefully for sending it for the examination of analyst ... I also collected samples of wet substance ... and oily substance from valve chamber separately.

Enclosure 1 to Annexure IV of Bihar Government Memorandum: Copy of the report of Prof. Pandey dated 3-3-1968: "The sample of water which I took from the storage tank after your request was analysed. From qualitative analysis it was found to contain petroleum products.

Enclosure 2 to Annexure IV of Bihar Government Memorandum (BGD 4): Report of inquiry regarding alleged disposal of oil in effluent by Indian Oil Corporation, Barauni Division, Barauni, by Shri Maheshwari Pershad, Inspector of Factories, Monghyr Circle: "Samples of treated effluents were taken from 3 points for analysis in our laboratory at Patna. The first sample was taken just after the effluent was coming from Guard Basin (guard basin No. 1 was on line), the second sample was taken about 8—10 yards from the first point of sample and the third was taken at the point of discharge in the dry river bed.

Enclosure 3 to Annexure IV of Bihar Government Memorandum (BGD 5): Report of Inquiry on the Indian Oil Corporation's, Barauni Refinery, disposal of water and effluents by Sri M. K. Roy, Chemical Inspector of Factories, Bihar: "Samples were also collected from the drain leading to central sewage pumping station. (2) the point of discharge in river Ganges; and (3) samples of wastes leaving the separators and guard basin on its way to central sewage pumping station.

BG 2: Samples of water were taken from the Ganges, Kasturba Water Works and Public Hydrants.

BG 5: Samples were taken from the effluent pump as well as from one of the drums in these trucks.

BG 7: Samples were collected on 5th, 6th and other dates and report regarding presence of mineral oil in volatile form was given.

BG 12: The Sub-Inspector of Police took samples of oil in two bottles ... and sealed them.

BG 14: The Sub-Inspector of Police took samples of oil in two bottles from a ditch in the field. ...

MMW 1: (p. 7-ER): Mr. Pandey came at about 3 o'clock in the night and he took samples from the mechanical filter.

(p. 10-ER): I have taken a sample from the pump. The witness identified the sample, No. S 1(RO 341/17) dated 13-8-1968 and said that that is the sample which he had taken.

CW 1 : (p. 147-ER): On a question put by the Chairman of the Commission : "Chairman saheb ne jo sample liya tha pump no. 5 sey, liye tha"?

Ans.: Yes.

(p. 149-ER): "Chairman saheb ne tel kay drum se sample liya tha"?

Ans.: Yes.

At the time when the Chairman has taken sample whether Sri Hajela, Sri Saigal and the Security Officer were present there?

Ans.: Yes.

CW 10: (p. 938-ER): Chairman: The sample taken was with you?

Ans.: Yes.

Do you remember one sample was taken from the suction point of the pump in the Ganges in the presence of Superintendent Water Works at Kastaharnighat?

Ans.: Yes.

Q. Second sample was taken at Water Works.

Ans.: Yes.

Q. And the third sample:

Ans.: The in-let water sample was collected from the Water Works where the water was entering.

Dr. Krishna:

Q. Could we go back to Appendix 'G'? Where was this sample collected?

Ans.: This was collected in river bank.

Q. No. 3 you have explained. I want to know where No. 2 was taken.

Ans.: There was some chamber after completing treatment. It was taken from the chamber.

Taking of samples was not denied. It can be held as proved.

13. Inspections being made by the officers of the refinery are admitted.

14. On 9-3-1968 discussion took place at the residence of the District Magistrate, Monghyr, at which Sri Kashyap, Sri Balwant Singh and others were present. Proved by BG2 and the evidence of Sri Balwant Singh, CW 6.

BG 2: On 9-3-68 I attended a meeting at the residence of the District Magistrate in the after-noon which was attended by Sri Kashyap, Chairman, Indian Oil Corporation, Sri Balwant Singh, General Manager, Barauni Refinery and the Chairman, Monghyr Municipality. At the meeting Sri Kashyap contended that the pollution occurred due to the shifting of the course of the river Ganges which led to the accumulation of oily waste on the sandy bed which melted with the advent of summer. This theory was not accepted by me and the Chairman, on being questioned by me as to why the refinery authority did not foresee it earlier and make proper arrangement, Mr. Kashyap replied: "crisis makes a man wise."

Shri Balwant Singh at p. 850-ER on a question put by Sri Misra: "Do you remember the discussions you had with me on 9-3-68 at the District Magistrate's residence?"

Ans.: Well, so many discussions were taking place; which part you tell me.

Sri Misra: In the discussion at Monghyr on the 9th March evening at the District Magistrate's residence when I, you and Mr. Kashyap and the District Magistrate were present, this theory of freezing and melting was propounded by you and Mr. Kashyap?

Sri Balwant Singh: Very possibly we are imagining you are trying to get a confirmation from me. I am sorry I have not discussed anything of the kind. I was saying that all possibilities will be examined and the reports they were giving me on my arrival at Barauni, well, I could feel there might be something in the channel itself. As they were assuring me that nothing went out of the effluent pipeline, I was guessing from where it could come.

Sri Misra : I am talking about the discussions we had on the 9th March at the District Magistrate's residence when this theory of freezing and melting was propounded by you and Sri Kashyap.

Sri Balwant Singh: Nothing was propounded there.

Dr. Krishna: This was suggested:

Sri Balwant Singh: All I said was we are trying to look at the channel and see what has happened.

Sri Misra: You said this may be one of the reasons.

Dr. Krishna: This was mentioned as a possibility?

Ans.: Yes, propounding a theory.

Dr. Krishna: Its likelihood was mentioned?

Ans.: I mentioned it in fact and not Mr. Kashyap.

On a further question by Mr. Misra (I am addressing it to Sardar Balwant Singh) that: Is it a fact that after arrival of Sri Kashyap and you on the scene on 9th March that the theory of freezing and melting was invented to suppress the actual fact of flow of oil from Barauni Refinery?

Ans.: I completely and emphatically deny this allegation.

15. Minister for Petroleum coming and inspecting the site and making inquiries is proved by MM 1, BG 5, MMW 1 and CW 1.

MM 1: On the 13th March 1968, Sri Raghuramaiah, Minister of State for Petroleum & Chemicals came to Monghyr and he saw the site of fire near Jamalpur Railway Pumping Barge and the Kastaharnighat and in-take pumping station of Monghyr Municipality and all the installations inside Kastaharnighat Water Works.

On 14th March, I and Sri S. K. Sinha, Municipal Commissioner, reached the Rest House of Barauni Oil Refinery (where the Minister was staying) at 6.00 p.m. and we remained with the Hon'ble Minister till evening while he was conducting inquiry in the Barauni Oil Refinery. The District Magistrate and Sri Ram Badan Kumar, Executive Engineer, PHED, Monghyr, were also present.

BG 5: On the 13th March, Sri Raghuramaiah, Central Minister of State for Petroleum & Chemicals visited Monghyr and talked to a large number of persons including officers and the next date at Barauni he questioned a large number of workers and engineers, etc.

MMW 1: (p. 12-ER): Then we had a discussion before the Minister and Sardar Balwant Singh. The Minister was there and I was there. I asked before the Minister why your people were removing oil by drums. He told me and the Minister that it was foolish on their part. They were trying to remove the evidence.

CW 1: (p. 154-ER): Chairman: What you are saying to us to-day, did you say so to any one earlier?

Ans.: I had said so to Sri Raghuramaiah.

16. A criminal case was lodged—MM 1 and MM 4.

MM 1: A criminal case was lodged before the Monghyr Police Town by one Brajindra Kumar, Advocate, on 8-3-68 against the management of Barauni Refinery and the Police started investigation.

MM 4: I also filed a criminal case before the officer-in-charge, Town Police, for the offence caused to them which is still under investigation.

17. Summary on the fact of contamination: The Monghyr Municipality has stated the facts of contamination in paras 6 to 9, 11, 15, and 17 of its memorandum thus:

Para 6: On 2-3-68 at about 8-30 p.m., Md. Wasim, the Pump Attendant informed Sri Brijender Narain Singh, the Water Works Superintendent on telephone that oily substance was flowing in the Ganges and he stopped pumping the water.

Para 7: ... some oily substance which was greasy and somewhat reddish and yellow in colour was floating in the storage tank and filter beds of the mechanical filter. ...

Para 8: ... The Executive Officer inspected rapid gravity filter along with the Superintendent and found the report of the Superintendent correct.

Para 9: After the inspection of the mechanical filter both the Executive Officer and the Superintendent, Water Works, rushed to the Kastaharnighat in-take pumping station and they found that some oily products was floating in the Ganges and was giving smell like kerosene oil. They also found a layer of a greasy substance of about $\frac{1}{4}''$ thick throughout the surface of the Ganges and near the barges.

Para 11: The Chairman inspected the rapid gravity filter plant shortly after his arrival at 1.00 A.M. in the night and he found that a thick layer of sticky, greasy, oily substance was found about $\frac{1}{4}''$ in the filters and the storage tanks and smelling like kerosene oil.

Para 15: I and Sri Satish Kumar Singh, Municipal Commissioner, went to Kastaharnighat in the morning of 3rd and when we reached there we saw that greasy oily substance somewhat red and yellowish in colour was floating in patches continuously in the Ganges. Besides this a substance like kerosene oil was floating continuously in the Ganges which was smelling like kerosene oil. A layer of thick substance was also found around the municipal barge in the Ganges.

Para 17: The Chairman travelled upstream to a distance of about 5-6 miles towards Barauni side with Sri S. K. Sinha, Municipal Commissioner, and they found that there was a continuous

flow of oily substance throughout the Ganges and the whole Ganges was full of thick yellow layer of greasy substance which was emitting smell of kerosene oil.

The Bihar Government has stated the fact of contamination in similar terms in its memorandum.

The Barauni Refinery in paras 9, 10, 17, 19 and 22 of its memorandum has stated :

Para 9: Sri K. P. Tuli, Production Engineer, Sri V. B. Hajela, Deputy Electrical Engineer (Power and Utilities) and Sri C. V. Ramamurthy, Senior Chemist inspected the Kastaharnighat and the river of Monghyr on 4th March 1968 at about 11.00 a.m. These officers observed a thin film of oil floating in a limited area near the barges. Some patches of oily material of about 1 mm. thickness was found to be floating in patches near the barge itself. To the same effect is appendix 'D' of Barauni Oil Refinery.

Para 10: The Deputy General Manager (Technical), accompanied by Sri C. D. Ayyar, Chief Electrical Engineer, also incharge of the effluent pumping station, reached village Chak at about 10 AM on 5-3-1968 ... while the mainstream of water is said to have appeared to be free from oil, patches of oily material and sludgy stuff were observed near the banks at a number of places.

Para 17: Sardar Balwant Singh, the then General Manager, Barauni Oil Refinery, reached headquarters on the 8th morning... In the after-noon, Sri Kumra, Chief Engineer, Central Water and Power Commission, Sri Balwant Singh, the then General Manager, Barauni Refinery and Sri S. N. Sahay, paid a visit to Monghyr.... On the way the river was inspected at Omarpur, a place situated about 13 miles up-stream of Monghyr. There were some traces of brownish patches of algae and grass soaked with oily scum.

Para 19: Sri Kashyap, Chairman, Indian Oil Corporation Ltd., accompanied by Sri Kurien, Sardar Balwant Singh and Sri Tripathi, visited Monghyr on the afternoon of 9th March. The party visited Kastaharnighat intake for the water supply to Monghyr town. At Kastaharnighat and the Jamalpur Ghat, some brownish oily scum soaked by algae and weeds was observed on the river bank. The party also observed small patches of brownish scum floating near the barge at the Jamalpur Ghat.

Para 22: On the morning of 10th March, 1968, Sri Kashyap, Sri Tripathi, Sri Balwant Singh and Sri Verma, Chief Process Engineer, inspected the river and went right into the lagoon in which the effluent channel was discharged. On the upper reaches of the bank from where water had reached some pocket of trapped oily scum was observed. There were wide-spread brown patches of sand showing traces of oil. Some small brownish patches of algae soaked with oil were also found floating in the lagoon. (see also Appendix H of BOR).

Again in para 3 of the counter-affidavit it is stated by the refinery thus:

We have only to state that it may be correct that some substance like oil were found floating in the Ganges on 2-3-1968. What was these were some reddish or yellowish substances which might have looked like oil as explained by us in para 24 of our affidavit and also the statement of Sardar Balwant Singh, the then General Manager of Barauni Refinery before the Commission.

It is, therefore, clear that the fact of contamination at Monghyr during the last week of February and first week of March, 1968, alleged by the Monghyr Municipality is admitted both by the Bihar Government and the Barauni Oil Refinery.

CHAPTER VIII

CAUSE OF CONTAMINATION

In this regard there in a differing version—the case of the Monghyr Municipality regarding the cause of contamination is thus set out in para 41 of its Memorandum: "From the facts mentioned in the above paras it is well established that oil beyond permissible limits had been discharged to the effluent pumping station and this oil was pumped to the Ganges through the effluent discharge pipeline. There are only two possibilities—one is that oil separating units in Sector 6 were not working satisfactorily and therefore oil in huge quantity found way to the effluent pumping station through the industrial and storm water sewage; the second is that oil was drained out through service and fecal sewage. It may be noted fecal sewage pipeline is connected with the railway loading yard inside the factory as well as the storage tanks and it is possible to drain out through these fecal sewage system also."

The Bihar Government in para 14 of its memorandum has said: "the facts emerging from these investigations appear to be that the oil separator was not functioning efficiently enough and that larger quantities of mineral oil and oily waste were being discharged by the effluent pumping station into the pipeline and finally into the river. On occasions the percentage of oil and oily wastes was alarmingly higher than the prescribed upper limit. The breakdown in the water supply was thus traceable entirely to the faults of the oil refinery."

The Barauni Refinery in para 24 of its memorandum gives the picture of the cause of contamination in the following terms: "As a result of our study and discussions, we are of the opinion that, in view of the design features of the oil recovery and the effluent discharge systems, it is not possible for oil from the process units or from the tankage to directly pass into the river. Even an occasional operational lapse in the oil recovery system cannot result in any large quantity of free oil finding its way to the river so as to cause a situation of the type which is alleged to have taken place at Monghyr. On account of the filtration effect of the sand, the water gradually seeped through the sand resulting in greater concentration of oil. Due to the slow movement of the effluent through the channel and practical stagnancy in the lagoon and the considerable settling time, there was greater accumulation of oil on the surface, which, combined with the algae, weeds, etc. formed a waxy scum. The high pour point of this scum combined with the low ambient temperature in winter possibly contributed to the increased formation of the scum, which gradually drifted to the banks of the lagoon. At the period when the ambient temperature rose in the end of February, the spongy material disintegrated and helped by the wind direction gradually found its way into the main-stream of the river en-masse. Ordinarily, any oil which is in free form, is not expected to traverse a distance of 50 miles to create a situation as had occurred at Monghyr."

Then in para 29 of its counter-affidavit the same plea is reiterated by the refinery, thus: "The allegations made in para 47 by the Municipality and the implications thereof have already been explained above. We again reiterate the explanation offered by us in para 24 of our previous affidavit and the subsequent explanation given by Sardar Balwant Singh, the then General Manager of Barauni Refinery, before the Commission. The Russian Chief Expert never said that our explanation was untenable, but on the other hand confirmed that the design of the oil recovery system was such that there was no possibility of oil as alleged passing through the effluent discharge into the Ganges."

Now we have to see which version has to be accepted and for this we have to refer to the documentary and oral evidence brought on record. But before doing that we would like to dispose of the legal objections raised by the Barauni Refinery lawyer in the written arguments. These legal pleas have been taken for the first time in the written arguments. Question arises whether these pleas have to be accepted. If the pleas are purely questions of law such pleas can be accepted even at a late stage. But if these pleas are connected with facts which require further investigation and taking of evidence such pleas cannot be accepted as it is bound to prejudice the other side. With this background we proceed to consider the pleas:

Plea with regard to Ex.BRD-39: The learned counsel for the refinery relying on Ex.BRD-39, a scheme prepared by Sri N. Sanyal, M.Sc. (Engg.), Senior Civil Engineer (Public Health), Barauni Refinery Project, contended that the far reaching and deep rooted implications of the sanction order of the Government of Bihar accepting the scheme (BRD-39) on 9th April 1962 as propounded by Dr. K. L. Rao blastered the very purpose of the scheme in the matter of dispersion, mixing, dilution and diffusion of the effluent as provided in Table 10 of the same. In other words, it is urged that by the above order a fool-proof method was evolved in supersession of the Russian formula of the diffusion works to be extended upto 1/3 span of the river and

the formula of Sanyal that the diffusion works should be extended only upto 250 ft. in the river bed. It also did away with the diffusion theory at the bottom of the river by spray and did away with Sanyal's theory of mixing with the swift current and left it at the discharge into a sandy bed allowing the effluent to go because the river Ganga is not dependable and produces deep scour and unpredictable erosions.

In order to appreciate the argument of the learned lawyer we have to peruse BRD-39 and the sanction order. But before doing so we would like to see whether this was the stand taken by the refinery in its memorandum earlier. It would be appropriate to refer to paras 65 to 67 of the Memorandum. The above paras are in reply to Memo No. 2, point No. 6, issued by the Commission. By this Memo the Commission wanted to know from the refinery the standards and specifications followed by it with regard to waste treatment and disposal systems.

In para 65 the refinery authorities have given a table to show the nature of discharge concentration of contaminants and standards followed and approved by the Bihar Government. In para 66 it is pointed out that the standards given in Col. 4 of the table, *i.e.*, U.S.S.R. standard is applicable to the refinery and the above concentrations have been calculated on the assumption that the minimum discharge of the river Ganges will be 1.70 lac cusecs. In para 67 it is said that to meet the above (meaning thereby the conditions shown in paras 65 and 66) the following conditions at the point of sewage discharge are maintained:

(i) floating films have to be absent;

(ii) dissolved oxygen content should be minimum;

(iii) an increase of the suspended matter concentration by 0.25 mg/L is allowed;

(iv) the maximum allowable concentration of oil products is 0.05 mg/L; maximum allowable phenol concentration is 0.001 mg/L; and

(v) the pH of the river water should not be changed by the discharged sewage water to a value lower than 6.5 or higher than 8.5.

Reading the above paras it becomes clear that the Barauni authority not only admitted the scheme and the approval order as true and valid but actually acted upon it. The new case now sought to be put forward by the refinery in the course of the arguments is that the refinery is completely absolved of all blame in the matter because the scheme for discharge of the effluent as suggested by the Russians had been modified to do away with the diffusion works as suggested originally and in its place the modified scheme had been sanctioned by the Public Health Department of Bihar Government.

It cannot be denied that this new case now set up is completely in conflict with the original stand. Question arises whether at this stage the refinery authority can be allowed to change its stand.

As discussed above if the plea set up now was purely a question of law such a plea would be allowed. But the plea taken is purely one of fact.

In paras 65—67 discussed above on a questionnaire issued by the Commission the Barauni Refinery authority had stated that the refinery was not only following the standards approved by the Bihar Government regarding the nature of discharge concentration of contaminants but in order to meet those requirements it maintained the five conditions mentioned in para 67 of the memorandum.

At page 77, Vol. I of the arguments, copy supplied by the Barauni Refinery authority under A.32, it is urged by the refinery that whatever is stated in paras 65—67 of the memorandum is wholly incorrect and proceeds on a misreading and wrong understanding of the legal position of sanction order of the Government of Bihar (Ex.BRD-39) and that on further consideration of this legal position the refinery was entitled to change its stand because such erroneous statements cannot be binding on the refinery as an admission. In this connection, the learned lawyer has placed reliance on the cases of:

Nand Kishore Bux v. Gopal Bux (1940 Privy Council 93) Banarsi Das v. Kaushi Ram 1963 S.C. 1165 Jagwant Singh & others v. Sitan Singh and others ILR 21 All 285 Maharani Beni Pershad Koeri v. Dudhnath Roy (1926 I.A. 216).

Nandkishore Bux Roy v. Gopal Bux Roy and others (1940 P.C. 93): This was a case where the Counsel for the plaintiff had accepted the findings of the trial Judge. On appeal it was held by the Privy Council that if the Counsel did accept such a finding it could only amount to an admission of a point of law which cannot be binding upon a Court and their Lordships do not consider themselves precluded from deciding the rights of the parties on a true view of the Law.

Banarsidas v. Kaushi Ram (1963 S.C. 1165): This was a case relating to partnership. In the plaint the plaintiff Kundanlal alleged in para 10 that the partnership being at will it stood dissolved. On 13th May (1944) when Sheo Pershad filed suit No. 105 of 1944 in the Court of Subordinate Judge, Lahore, Banarsi Das, the defendant, in his written statement admitted this fact in more than one place. The question arose as to the binding effect of this statement. It was held that an admission insofar as facts are concerned would bind the maker of the admission

but not insofar as it relates to a question of law. This case does not support the contention of the Barauni lawyer because the statements in paras 65—67 of the Memorandum are all facts and not questions of law. The refinery would be bound by those statements as its admission.

Jagwant Singh & others v. Sitan Singh & others (ILR 21 All 285): This was a case where the plaintiff in a mutation proceedings had admitted that he and the two sets of defendants were on Salig Singh's death the owners of the property in equal shares and relying on that statement it was contended against the plaintiff in his suit for possession that he was bound by his statement, even though, as a matter of fact, he was the sole owner. The District Judge held that the plaintiff was bound by that statement. On appeal it was held that an admission on a point of law is no admission.

Maharani Beni Pershad Koeri and others v. Dudhnath Roy (Vol. 26 I.A. 216 1898-89): in this case the Counsel had made an admission that receipt of rent by the Maharaja operated as confirmation of the pattah. This was accepted by the High Court. In appeal to the Privy Council it was held that the admission was erroneous in point of law and does not preclude the Counsel for the appellant on this appeal for claiming his client's legal rights.

In the cases relied upon what has been laid down is that a party is not bound by its admission on question of law or by its misunderstanding of its legal rights in relation to set facts and it is open to the party to invite the Court to apply the correct law to the facts ignoring the legal stand taken by the party. These cases have nothing to do with the question as to whether the party may be permitted to, at the stage of the final arguments, to radically change or alter the position on facts taken by the party at the outset and in the course of the proceedings. The original stand taken by the refinery is in direct conflict with the stand now sought to be taken in the course of the arguments and has nothing to do whatsoever with the misreading of law.

The statements contained in paras 65 to 67 are supported by an affidavit of the General Manager. In his affidavit the General Manager says that the statements made by him are based on information received by him from 16 officers of the refinery. He has mentioned their names with designations.

The contention of the learned lawyer for the Barauni Refinery is that this affidavit is not in conformity with the form and the manner required by the provisions of the Civil Procedure Code Order 6 Rule 15. We do not agree with the contention that the affidavit is not in the proper form. Along with the notification first issued by the Commission we had pointed out in which manner the affidavit should be filed and the form pointed out is in conformity with the provisions of the Civil Procedure Code. What was required was that if the deponent was giving the statement basing it on his personal knowledge he should say so and if he was basing his statement on the information got from others he should show the source of knowledge. The affidavit filed by the General Manager does not show that it was based on his personal knowledge. It shows that what all he is stating is on the information given to him by the refinery officers. The affidavit, therefore, is in order and in the manner specified in the notification and Order 6, Rule 15, CPC. It was further urged by the learned lawyer for the refinery that since the affidavit is not in the manner and form required the entire memorandum which is based on it will have to be rejected. As discussed above since the affidavit is in the proper form there is no question of the memorandum being thrown out because non-compliance with the provision Order 6, Rule 15, CPC would only amount to an irregularity not affecting the jurisdiction which can be cured. We may refer to the cases of Qanayat Hussain & others v. Musamat Sajidunnissa Bibi (1949 All. 499-501); Mittulal Singhani & Others v. Pursotam Debi Bagla (1940 Cal. 385—388); and River Steam Navigation Co. Ltd. v. Khanta Kumari Banik & others (1934 Cal. 632). Even otherwise it cannot be so rejected. Memorandum is in the form of a pleading though not strictly a plaint. A plaint or a written statement also if it is defective in the sense that it has not been properly verified it cannot be thrown out and the party would be called upon to verify it.

Kalidas Dhanjibhai v. The State of Bombay (1955 CS 62): This is a case where the appellant had applied for registration under the Bombay Shops & Establishment Act and in the statement made under Sec. 7 he called his establishment a "workshop" and described the nature of his business as a "factory".

He was prosecuted for not maintaining "leave registers." The learned trying Magistrate held that the concern run by the appellant was not a shop. Holding so he acquitted the appellant. The High Court on an appeal against the acquittal held that it was a shop and convicted him. Against that order the appellant came to the Supreme Court in appeal.

The Supreme Court held that the opinion of the appellant about the legal effects of the facts stated is of no consequence in construing the Section.

The present case is not of this nature. This ruling therefore does not help the contention of the lawyer for the refinery.

Lakshmidevamma v. Keshav Rao (1935 Mad. 1066): This was an appeal arising out of a suit filed by the plaintiff claiming the property as the revisioners and heirs to the property of one Kesavan Nambi after the death of his widow Kunjuri the defendants pleaded that the plaintiff could not claim the property in view of the

declaration made by plaintiff's father that he had no right. The Court of first instance as well as the first Appellate Court held against the plaintiff. In appeal the High Court held that the plaintiffs were not estopped from contending that they had a right to the property because the declaration given by plaintiff's father was made under the influence of an erroneous view of his legal rights, which were common to both parties and his repudiation of right can stop him from contending after he has discovered his legal error, that on a true interpretation of the will he has title. It was further held that act of acquiescence in the possession by defendant No. 1 of the properties cannot stop plaintiff nor when he was ignorant of the legal rights and did not allow defendant No. 1 to suffer detriment by suppressing any knowledge of a defect in her title.

The present case is not one of this nature. This ruling, therefore, cannot help the learned lawyer for the refinery.

Jagatnarain Singh v. Salik Ram Singh and Others (1938 Oudh. 110): This is a case where after the death of the widow plaintiff No. 3 who is also a revisioner along with the defendant put in a joint application in the Revenue Court for mutation in respect of all the villages praying that mutation be made in favour of the plaintiffs and the defendant half and half. Accordingly mutation was made half and half. Subsequently the present suit was instituted by the plaintiffs claiming possession of one-fourth share from the defendant. The defendant pleaded the family arrangement and also that plaintiff No. 3 was estopped from claiming any more share.

Both the Courts below over-ruled defendant's plea. On appeal that finding was upheld on the ground that the 3rd plaintiff was not estopped from claiming one-fourth share as he was under the Hindu Law entitled to that share.

On the merits also this plea has no substance. The first affidavit filed is by the General Manager of the refinery. In the written arguments it is not shown on what basis it is said that the statements contained in paras 65—67 were wholly incorrect and proceeded on misreading and wrong construction of the sanction order. When the lawyer was asked whether this was based on the instructions of his client he said "yes"; but did not disclose the identity of the person who stated so representing the refinery. There is also no affidavit to that effect. To accept this present version which is not supported by any affidavit would amount to this that the General Manager who filed the first affidavit made all false and irresponsible statements either knowingly or carelessly without proper inquiry with a view to mislead the Commission which the Commission is not prepared to accept for the simple reason that if what all was stated by the General Manager in paras 65—67 was false or incorrect the present stand which is taken now at the time of arguments that BRD 39 was from the outset unworkable and, therefore, there was neither obligation under it to discharge the effluent into the river nor is there any breach of the obligation by the refinery would have been taken earlier. But it was not done so. On the other hand, all along the inquiry the stand taken was that BRD 39 was not only proper and valid, but that the refinery was following the system of disposal of its effluent as provided by BRD 39 and that the effluent with the prescribed limits of concentration of oil was in fact being discharged into the river. The oral evidence that was laid was also on the same understanding which is clear from the evidence of Sardar Balwant Singh, CW 6; Sri Kumra CW 7; and Sri T. S. Rao, CW 10. According to these witnesses the connections with the river of the effluent channel were broken by silting after the monsoon in 1967 and subsequently thereafter the effluent cut its own channel alongside the river across the sandy bed. The further impression which was sought to be created that the recession of the river from the point where the effluent was being discharged into it was a subsequent happening, *i.e.*, long after the scheme of discharge of effluent had started operating. Even in the cross-examination of MMW 2 and MMW 3 by the learned lawyer of the Barauni Refinery we do not find any indication about the invalidity or defects or ineffectiveness of the order.

The fact that what is stated in the memorandum of the General Manager is true is supported by the statements of Sri Harnal and Sri Iyer filed in the form of affidavits in reply to the questions issued to them by the Commission.

Sri Harnal, in Q.No. 10, was asked referred to the accumulation of oil and fire on Ganges at Monghyr on 2nd and 3rd March, 1968, to state whether he fully agreed with the contents of the affidavit dated 19-6-1968 submitted by the General Manager, Barauni Refinery, containing replies to the questions issued by the Commission of Inquiry and if he did not agree with some parts what was his version of those parts. In answer he stated: "I substantially agree with the affidavit filed by the General Manager of the Barauni Refinery." To the same effect is the reply of Sri Ayyar contained in answer to Q.No. 7 which was in similar terms. His answer is: "I agree generally with the particulars given in the affidavit dated 19-6-1968 submitted by the General Manager, Barauni Refinery, pertaining to the details of the effluent pumping station, effluent lines and the design data of equipments and structures installed in Sector 6 which directly concern the public health and power and utility department."

Both the above replies were received in the Commission's Office on 5-4-69 and 7-4-69 respectively. It is on the basis of the memoranda filed by the refinery, the Monghyr Municipality and the Bihar Government that the Commission

called for other evidence—both documentary and oral. To say now at the stage of the arguments that the memorandum should be thrown out and the Commission should find out the facts for itself and it is not bound to act upon the statements made is totally absurd. Had the refinery and its officers admitted before the Commission that from the very start they were not discharging the effluent into the river much of the time and the labour of the Commission would have been saved and the Commission would not have called for so many documents and recorded the evidence of 14 witnesses covering about 1260 pages and would have decided the matter on the affidavits alone which were also sufficient in number.

It is, therefore, clear that the case now tried to be set up is an after-thought and being in conflict with the earlier stand cannot be allowed to be taken up at the time of the final arguments. This plea is, therefore, rejected. In the result, BRD-39 would stand as proper and valid.

After this we have to see the effect of BRD-39 and its implications for which we have to refer to its salient features. It is appropriate to reproduce them here:

1. *Location of disposal works*: The Russian Engineers were not agreeable to accept my proposal for disposal of the effluent by a method of spraying on the water surface from near the bank. They wanted that a method of diffusing the effluent from the bottom of the river from a number of points extending over 1/3 of the width of the river should be adopted. The method desired by the Russians is no doubt ideal.

No location was found where we could take our diffusion works upto 1/3 width of the river as the river is very shallow on the left bank and the problem has been accentuated by sand banks coming up here and there in the river bed. The site close to the Ganga bridge though provides an unbroken width of the river, could not be selected as the annual fair involving large scale bathing and extending over a month is held on the sands of the left bank here.

The point of disposal has been seleced from the following considerations:

(a) the furthest into the river that we could take the disposal point;

(b) away from human habitation;

(c) the point is just upstream of a large bay formation;

(d) river flow is available even in the dry season;

(e) a high alluvial bank of no recent formation is available there.

2. *Disposal works in river bed*: The work in the river bed for the disposal of the effluent on the lines suggested by the Russian engineers is shown in Appendix Nos. 3 and 4.

Taking the diffusion works upto 1/3 width of the river bed as desired by the Russian Engineers is not practicable as sand banks come in the way. Moreover, the cost would be prohibitive. Limited as we are in the width I have proposed only about 250 ft. length of works in the river bed. Although theoretically the required dilution will not be available immediately after the waste is discharged into the river, the swift current available at the site even in dry weather will soon disperse the waste into large volumes as the flows to give the dilution required. This, in my opinion, should be satisfactory in the difficult situation, we are faced with. I may mention here that the required dilution has been based only on 1/3 of minimum flow of the Ganges.

The industrial sewage treatment plant within the refinery designed by the Russians provides treatment to reduce the concentration of contaminants in the effluent to be discharged into the Ganges.

Table No. 10 shows nature of discharge, concentration of contaminants in the effluent after treatment, concentration after being mixed with only 1/3 quantity of minimum flow* in the Ganges and concentration allowable by U.S.S.R. sanitary standard.

TABLE NO. 10—CONTAMINANTS, LIMITS AND STANDARDS

Nature of discharge	Concentration after treatment mg/L	Concentration after discharge in river mg/L	Concentration allowable USSR standard mg/L
Oily	50	0·006	0·05
With coke fines	18	0·0003 (increase in suspended matter)	0·25 (increase in suspended matter)
With phenol	50	0·0001	0·001
With sodium sulphide, disulphide and caustic soda		6·73 (D.O.)	6·00 (D.O.)

*Minimum discharge 1·70 lac cusecs in 1958 *vide* p. 43 of Government of Bihar—Preliminary data relating to the sites for the oil refinery at Barauni—June, 1959.

3. *River outfall*: On the suggestion of the M.D. the Chief Engineer and the undersigned called on Dr. K. L. Rao, M.Sc.(Eng.), Ph.D., MICE., MIE. Member (Designs & Research) CWPC, in his office in New Delhi in the afternoon of June 14, 1961, to seek his advice on the above disposal works in the river bed. He was of the opinion that river Ganges is not dependable as she produces deep scour and unpredictable erosion and works in the bed should be avoided as far as possible.

Following this, it was decided in a meeting held in M.D's. room in New Delhi that a simple straight forward river outfall only be adopted in supersession of the elaborate diffusion works in the river bed.

Accordingly the proposal shown in the Appendix No. 6 is drawn up. According to Dr. K. L. Rao, the bank is vulnerable upto a distance intercepted by a straight line drawn at 15°C with the abutment of the bridge which works out to about 600 ft. Therefore, the outfall sewer is pushed back 600 ft. inland from the river. The outlet ends with a flood flap valve fixed in the headwall and the effluent will flow from this point to the river through an earthen channel.

4. *Fecal sewage treatment plant*: I, therefore, recommend an activated sludge plant for the treatment of fecal sewage from the refinery and the town-ship.

(ii) Comparison of the activated sludge methods. The two most popular activated sludge methods are: (a) the diffused air system and (b) the mechanical agitation system. Capital and running cost are more or less the same for both. The diffused air system is generally considered to be particularly reliable and capable of withstanding over-load and ensures purification at a high rate. Average performance of the two types of plants checked side by side at Manchester is shown below:

	Effluent from	
	Mechanically agitated plant	Diffused air plant
1. B.O.D. ppm.	0·154	0·136
2. Suspended solids ppm.	0·145	0·160
3. Average detention period insertion tank (hours)	13	9·61
4. Average H.P/m gallons absorbed	28·35	29·26

Besides these, a large amount of iron work and machinery in the case of mechanical agitation system are exposed to atmosphere encouraging rusting, while the iron-work in the case of diffused air plant consists mostly of piping, which is comparatively more rust-resisting. I, therefore, adopt diffused air system.

"I have included a sewage treatment plant consisting of screening and grit chambers, measurement, settling tank, aeration tank, humus tank and sludge digestion and drying beds for treating the service and fecal sewage from the refinery and fecal sewage from the township".

NOTE: The plant has now been constructed by the contractors—Messrs Mitra & Co. on the Diffused Air System and is under trial. They have guaranteed to give reduction in B.O.D. and suspended Solids as shown above in the Table for the diffused air plant—vide G.M's affidavit paras. 58 and 69.

The first thing that the Commission has to see now is whether BRD-39 was defective and inoperable. What is urged by the Barauni Refinery Counsel is that BRD-39 did away with the original provisions for diffusion and dilution suggested by the Russians and instead a formula was provided suggesting the shifting of the discharge by 250 ft. and subsequently to 600 ft. back and leaving the discharge not in the river bed but in the sandy bed and to be led into the river through an earthen channel to be constructed by the refinery. It is true that by the modified proposal, the original proposal of the Russians of dillusion by 1/3 of river discharge was done away with and, instead as stated earlier a new formula was proposed but even by this formula the fact of complete dilution was not affected. The engineers of the Barauni Refinery themselves had inspected the site, the officers of the Bihar Government also after inspecting the site accepted this new proposal proposed by Barauni Refinery itself. We do agree with the contention of the learned counsel of the refinery that by this new proposal the method of diffusion was completely done away with but merely because the diffusion was done away, it cannot be said that the proposed scheme had become ineffective for the simple reason that the other fact namely dilution was still there, though not to the extent originally proposed by the Russians.

The next question which was raised by the Learned Counsel for the Barauni Refinery concerns the actual point of discharge as defined in Annexure II, Point 10-B. What is urged by the Learned Counsel for the refinery is that the scheme approved provided that the discharge should be at a definite point 10B and at that point there was no current available for dilution of the effluent and whatever effluent was being discharged was discharged on a sandy bed. He also urged that the point 10B is a mandatory provision which could not be affected or altered by the refinery.

So far as the first point is concerned, it is true that Annexure II shows the discharge at point

10B. But this point was selected after the engineers of the refinery themselves, as well as the engineers of the Bihar Government who visited this spot and found by joint inspection that there would always be a flow of water available which even in dry weather will soon disperse the waste into larger volumes as the river flows to give the dilution required. One of us (Sri Modak) who was consulted in 1962 also agreed to this selection of the spot. It would be appropriate to refer to his comments. He says: "the point selected for the discharge of the effluent into the river appears to be the only suitable spot for this purpose, no other suitable point appears to be available in this region." When according to the engineers, at the time this sanction was given, flow of water was available, it is futile to say that the discharge at point 10B was in the sandy bed. In this connection, it would be appropriate to note that the authorities of the Barauni Refinery as well as the Bihar Government did not seem to have taken into consideration the fact whether the river would recede. On the other hand, what appears to us is that they took it for granted that there would not be recession of river at all and probably it was on this assumption and having found after inspection that the flow of water was there—this proposal was made by the Barauni Refinery and accepted by the Bihar Government. If this proposal was defective in the sense that there was no water available for the dilution of the effluent, it was the duty of the refinery authorities first to bring this fact to the notice of the Bihar Government. It was also incumbent on the Bihar Government's Inspector of Factories to see whether as a matter of fact the scheme proposed was working properly or not or whether there was dilution of the effluent as such. We are sorry to note that neither the refinery nor the Bihar Government tried to see whether the scheme was properly working, *i.e.*, the effluent was falling into live current of the river Ganges. The result was that the effluent which was being discharged was not mixing with the water but it was falling on the sandy bed and followed the course of the channel in the river bed. We cannot agree with the contention of the Barauni Refinery's counsel that since the sanction order only permitted discharge upto point B which the refinery was doing, the refinery cannot be said to have committed any breach of law. It is very difficult to accept this contention.

Section 12(1) of the Factories Act is very clear which casts an obligation on the refinery to provide for effective arrangements for the disposal of wastes and effluents. This is a mandatory provision. If the proposal was defective as is now contended, the refinery authorities ought to have taken suitable action to get the defect rectified and make an effective arrangement for the discharge of the wastes. The contention of the Learned Counsel for the refinery is that this provision has to be read subject to cl. (2) of Sec. 12(1) which casts a duty on the State Government to make rules. Relying on this provision, it is further urged that under Rule 16 sub-clause (8) proviso (2) read with (b) which says: "that the approval of the Chief Inspector mentioned in sub-rule shall not be necessary in the following circumstances:

> (b) when the arrangement and scheme for treatment and disposal of the wastes of the factory has been approved by the Director of Health Services, it was not necessary for the refinery to move the factory inspector in this matter."

In the first instance we are not prepared to agree with the contention of the Learned Counsel for the Barauni Refinery that Sec. 12(1) is subject to cl. (2) of Sec. 12. Sec. 12(1) is an independent provision and mandatory whereas Sec 12(2) is only discretionary. It may be that the Bihar Government may frame rules or may not frame them. Even if the Bihar Government framed rules and ultimately these rules are found to be invalid or void, can the refinery authority say that it has no responsibility and is relieved? Our answer will be 'no'. Now let us consider it in another way. Take it that the Bihar Government does not frame any rules, can the refinery be relieved of the responsibility under Sec. 12(1). Here again we have to say 'no'. The responsibility of the Barauni Refinery will be there whether a rule is framed or not and even if the rule framed is held invalid. It is the primary duty of the refinery or any factory to provide for effective arrangements for the disposal of wastes and effluents and this will be irrespective of any rule. If the contention of the learned counsel for the refinery has to be accepted it would amount to this that the refinery through Sri Sanyal, its engineer, put forward an arrangement which it knew was defective and the approval of the Government of Bihar was secured by fraud or misrepresentation. It is a well known proposition of the law that any consent or approval which is proved to be obtained by fraud or misrepresentation is void and of no avail. It is equally well known proposition of law that a party cannot get the benefit of his or her fraud as the case may be. It, therefore, does not lie in the mouth of the refinery to say that BRD-39 is defective or inoperable. If as is contended that BRD-39 was inoperable from the very outset we shall have to hold that right from the date of the approval of the scheme submitted by the refinery it was discharging the effluent without any permission.

BRD-39 clearly indicates that the purpose of the scheme is to secure a degree of the dilution of the effluent by putting it into river flow. In appendix 6 it indicates a minimum depth of 20 ft. of river water at the point at which the effluent is allowed to flow into the river which means that the effluent will receive dilution the moment it is discharged into the river. It may be noted that the essential and integral part of

the scheme is the discharge of the effluent into the flow of the river. The scheme, therefore, cannot be understood to mean that its object was merely to discharge the effluent at a particular point irrespective of whether or not at that point there was secured dilution by mixing with the river flow. The scheme has to be read along with table 10 and understood as one by which the refinery understood to discharge the effluent of less than 50 ppm oil concentration into sufficient river water to enable the dilution required thereby. The basic assumption of the scheme was that at the point of discharge there would be river flow available and that consequent upon shifting of the river there, an obligation to extend the channel must be incorporated into the scheme as without such an understanding the scheme would be meaningless. Having this in view, we have to see now whether it was the duty of the refinery or not to move the Inspector of Factories of the Bihar Government pointing out the defect in working of the scheme. Since the refinery was already in existence on the date on which the amended rule 16 came into force and the original scheme was approved by the Director of Health Services it was not necessary for the refinery authority to get the approval of the scheme once again by moving the Inspector of Factories under Rule 16 Cl. (8) proviso (ii) and what was necessary was that an attested copy of the letter of approval with complete details of the arrangements for the scheme for the treatment of disposal and wastes had to be submitted to the Chief Inspector within one month of the date of approval.

It is pertinent to note that even this action was not taken by the refinery. The contention of the learned lawyer for the Barauni is that as the refinery or its staff could not in any way alter or modify the final phase of the approved scheme and was bound to dispose its effluents only according to it which as a matter of fact it was so doing, it was not necessary for it to take any such action. We are not prepared to accept this argument. It is not correct to say that the approved scheme was so rigid that the refinery could not alter or amend it for the simple reason that the primary duty to provide effective arrangements is of the refinery and even if the Bihar Government had approved a defective scheme the refinery could not be relieved of its liability. That the scheme could not be so rigid is clear from the fact that according to the scheme the effluent was to flow from the out-fall points into the river through an earthen channel but instead of it another 600 ft. pipeline was laid. This is a clear deviation. That it is not so rigid is further clear from the fact that according to the terms and conditions of BRD-39 fecal sewage with storm water from the refinery as well as the town-ship was to receive complete treatment before it mixed with refinery waste and discharge into the river. If this condition was rigid the refinery ought to have followed it strictly by discharging the fecal sewage after treatment. But admittedly it was not done so, on the other hand, untreated fecal sewage was discharged. We may point out here that this is not only a deviation from the scheme but a serious breach of the terms and conditions agreed to between the parties. (The refinery and the State of Bihar).

Yet another argument was advanced by the learned lawyer for the refinery that the Civil Court in suit No. 39 of 68 and the Criminal Court in case No. 95M of 68 had passed an injunction and restrain order and even if the refinery wanted any alteration or amendment it could not do so. This argument has no merit. The injunction order by the Civil Court was only to the extent of the running of the machinery and the process of production which was subsequently modified by directing the refinery to run the machinery taking care not to discharge contaminated matter in the Ganges. The order of the Criminal Court was for the closure of the refinery which was subsequently modified. Thus it would appear that neither the injunction order of the Civil Court nor the restrain order of the Criminal Court had anything to do with the question whether the refinery could move the authorities concerned for amendment or modification of the scheme BRD-39.

We next proceed to consider whether the scheme BRD-39 as proposed and approved was defective and inoperable. The very fact that till the date of the written arguments no complaint was made by the refinery that the scheme proposed was not operable is clear indication that there was no defect whatsoever in the sense that at the point selected the effluent was mixing with the active live current. The fact that there was no defect is further clear from the evidence of CW-6 at p.742(ER). On the following question put by one of us (the Chairman): "I want to know as per the design of the scheme the effluent discharge had to mix with the river Ganges, is it correct"? He said: "yes". On a further question on the same page: "Can you tell us whether at any time at the discharge point the effluent was mixing with water"?

Ans.: In January 1967 and earlier in November a report was made that the valves had been damaged. People had stolen parts of those valves. I inspected the place in January 1967. (p. 743-ER).

Further question was put: "what should be inspected"?

Ans.: Pipeline.

On the following question put (p. 753-ER): "the main point of the Government condition is that it must reach the water, be mixed with the water and so much dilution provided. Was it done in February 1968"?

Ans.: As I have said at the time of inspection, I saw this channel going straight

from where it fell into river water. I have not seen this in January 1968.

CW 6 was further questioned by one of us (Sri Modak): How do you know that it is mixing properly and that the water is according to particular standard?

Ans.: I inspected after the incident and issued instructions. Insofar as I was concerned I was assuming all the time that the facility has been established and is functioning well. There is no report to the contrary made to me saying that this facility presented any trouble.

The question that arises is when did this effluent fail to mix with the active live current. The case now sought to be brought out by the refinery in the arguments is that right from the very beginning, *i.e.*, the date of the approval the effluent had to be discharged on the sandy bed according to the approval order which the refinery was doing and as no current was available there it cut its own channel and took its course. This case now set up being directly in conflict with the original stand taken in paras 65—67 of the Memorandum was rejected on 19-4-69 while we were considering the petition of the refinery filed on 14-4-69. It follows, therefore, that the effluent discharge at the point was meeting the active live current of the river. There is no direct evidence to show whether at any subsequent time it was noticed by the refinery authorities that the effluent was not mixing with the live current. CW-6, Sri Balwant Singh, the then General Manager of the Refinery, in his evidence at p. 745-ER says that he had given instructions to make an inspection of the line every year just before and after the monsoon. When he was asked whether there is any record to show that *any* inspection was made, he very candidly admitted that he did not have such record and said further that to his knowledge he does not know whether any other had inspected. The refinery authorities also have not filed any such record. During the cross-examination by Sri Misra on a question being put by one of us (Dr. Krishna) at p. 818-ER to CW-6:

Can you kindly produce evidence to show that it was within the knowledge of the refinery authorities that the effluent was actually being discharged in the river in 1964, 1965 and 1967.

Ans.: About 1964, I have no knowledge. About 1967, I have personal knowledge for which I am here and I have no knowledge from 1964—67. According to my knowledge the out-fall was falling into the river. Possibly the water in the stream was not much. The flow was very little. In the year 1967 after the monsoon the channel due to the river recession the flow completely stopped which went un-noticed till the incident.

Cross-examination by Dr. Krishna, p. 828-ER:

I am asking you standing there at that point ...Did you not see this effluent channel in the sandy bed going its course?

Ans.: No.

On cross-examination by Sri Misra: "So far as your eyes could see"?

Ans.: There was some flow of water and the channel was going straight at the point of discharge into the river.

Q. I am asking when you were at the fag end of the effluent 48" pipeline did you not as far as your eyes could see, that an effluent channel flowing?

Ans.: I saw the river flowing alright.

Q. The effluent channel in the sandy bed?

Ans.: I saw the effluent channel mixing with some flow of water if that will satisfy you.

Q. In January 1967 you were standing at the point where 18" steel pipeline ends. Now down below is this effluent channel on the sandy bed?

Ans.: Down below as the flowing water of the river. The water although it was not very much, water from the up-stream was coming and then it had two branches in between sandy bit, this effluent was falling and mixing.

On further cross-examination by Sri Misra at p. 829 ER:

Q. Do you mean to say that before the post-monsoon period of 1967 this sandy effluent channel standing very near the discharge point of the 48" steel made pipeline was connected with the river Ganges?

Ans.: That is precisely what I have meant. There was some flow of water in January and my personal assumption and presumption was that this was going to the river Ganges. I have already stated I have not seen the discharge point.

At. p. 830-ER—on a question by one of us (Dr. Krishna):

Q. He is asking whether the stream was coming to join the place where the effluent was discharging. To what extent you saw the up-stream part? You said towards the flowing bed. The question is, is it from river Ganges?

Ans.: This obviously was from river Ganges.

On a further question by one of us (Dr. Krishna at p. 831-ER: He answered the river has receded in the monsoon 1967. We were not aware and were caught unaware.

From this it becomes clear that before January 1967 nobody from the refinery visited the pipeline to see whether the effluent was mixing with active live current. It may be noted here that this was the main condition of the agreement between the refinery and the Government of Bihar.

It would be appropriate here to consider the condition of the channel through which the effluent was being discharged but before doing so we would like to see whether the channel which existed in 1964 when the refinery started discharging the effluent was the same which continued till the date of the incident. From the question put in cross-examination to CW-8, Sri Raghuramaiah, the Minister, at p. 735-ER, by the Learned Counsel for the refinery, it appears that the refinery wants to show that after the monsoon of the year 1967, the channel which was functioning from 1964 till October 1967 got sealed away and it had no supply from Ganges.

The contention of Shri Misra, Learned Counsel for the Monghyr Municipality and Shri R. B. Singh, learned lawyer of the Bihar Government, is that the channel which existed in 1964 was the only channel which continued as such and no new channel was constructed and this channel also got disconnected with the result that the effluent was not falling directly into the Ganges. In this connection, our attention is drawn to Appendix II to Sanyal's report and the evidence of Sri Kumra, CW-7.

Sanyal's report, Appendix II, only shows the existence of one channel. Sri Kumra at p. 625-ER, has said on a question put by one of us (the Chairman) referring to his report about the condition of the channel, that the effluent channel was earlier connected with the river from the upstream side which got silted up recently and has disconnected from the main river. The effluent channel now is more or less a dead channel during the non-flood season.

On a further question put by Dr. Krishna whether this effluent channel which he referred to was not covered during the 1967 monsoon and a new channel got made after the floods in the same sandy bank? "He said 'no' this channel is not a new channel".

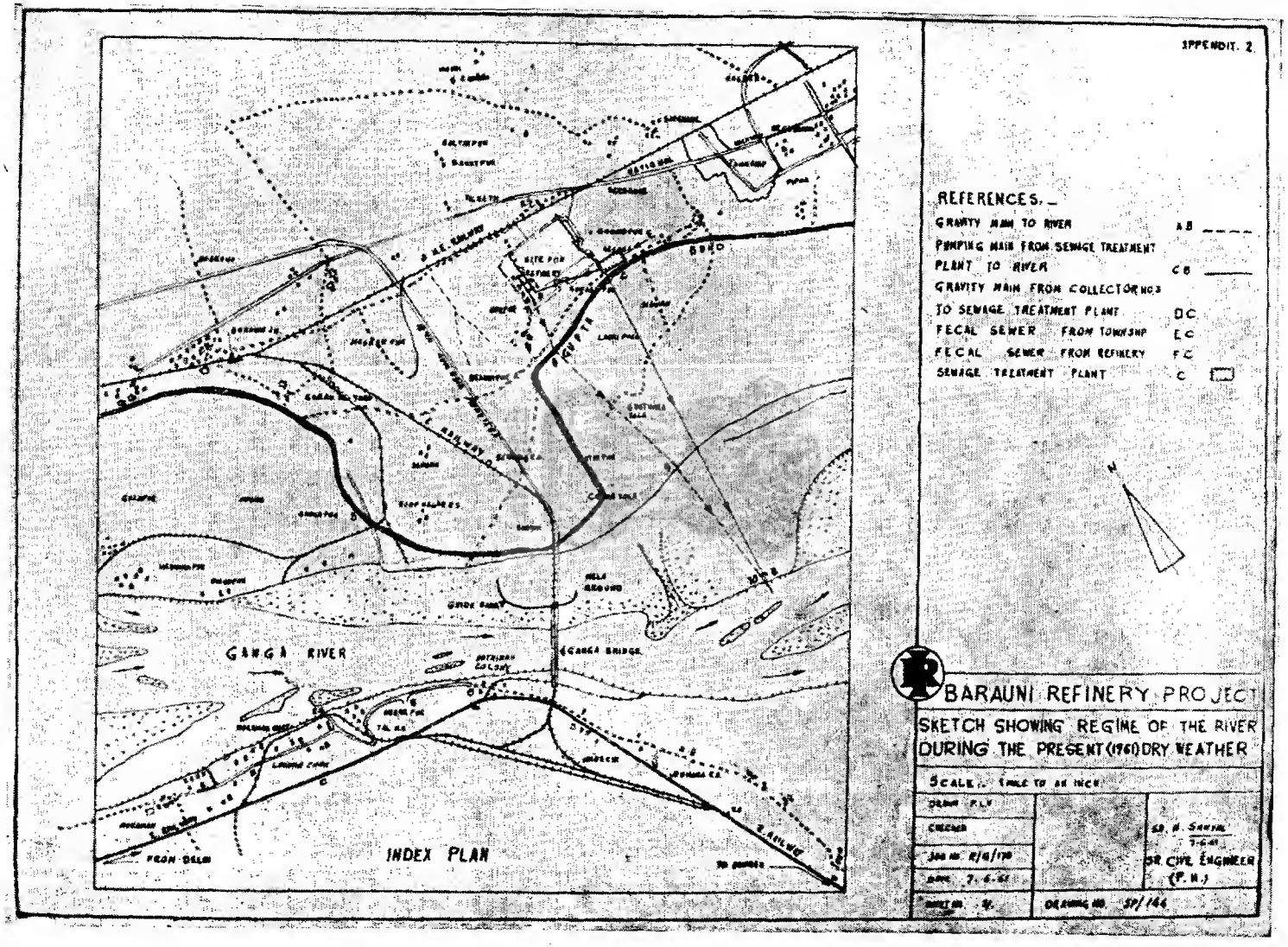
On another question put by Dr. Krishna—Does it mean that it might have existed after 1966 flood monsoon, 1965 flood monsoon also?

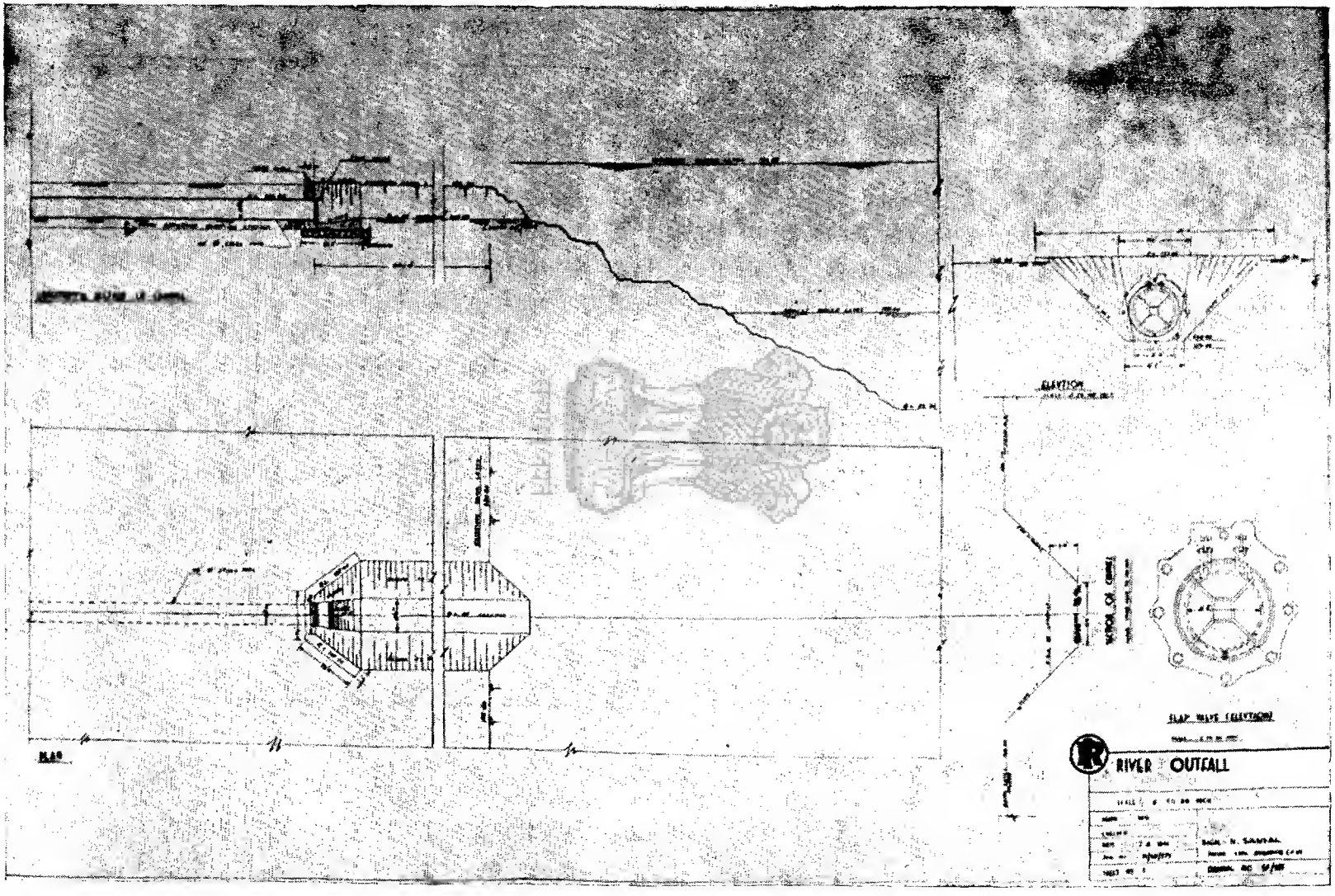
Ans: This shoal keeps on changing this channel and the main river. The main river is of course on the right side and there is a shoal in between. Now the size, location keeps on changing with the amount of discharge coming, the velocity, direction and all those things, it keeps on changing. So I do not say that this channel was previously or for many years connected with the river. I can only say after seeing the earlier river plans survey.

Sri Kumra, in his report Ex. OD-4 and evidence, has also stated that the effluent discharge pipeline discharged the effluent into an old creek of river Ganges and at the time of inspection this old creek was not connected with the Ganges. It is nowhere stated either in the memorandum of the refinery or the counter-affidavit filed that the effluent was falling into an old creek of the Ganges which was connected with the main river. On the other hand, the stand taken by the refinery appears to be that the effluent was falling in the main stream of the river Ganges during pre-monsoon period of 1967 and it was during the post-monsoon period that the Ganges receded two miles south and by freak of nature the effluent channel existing at the time of the incident was created which is very clear from the questions put by the Barauni lawyer to Sri P. K. Misra, Chairman, Monghyr Municipality, MMW-1 at pp. 26-ER. In this connection, we would like to refer to the statement contained in paras 90 and 91 of the Memorandum wherein it has been admitted that the effluent was being discharged into the effluent channel which was existing from 1964, that this channel has been blocked by the refinery after the incident and the drawing and dimensions of the channel for every year from 1964 to the date of the incident were not available and for the first time the drawings were prepared in May, 1968, in reply to a question issued by the Commission.

Reading the above statements together with the statements contained in paras 90 and 91 of the memorandum it becomes clear that there was only one channel existing from 1964 which continued as such and after the monsoon of 1967 got silted.

The contention of Shri Misra, the learned lawyer for the Monghyr Municipality and Shri R. B. Singh, the learned lawyer for the State of Bihar is that there was only one channel according to paras 90 and 91 of the Memorandum of the refinery and that got blocked in 1964 only. Whereas it is contended by the lawer for the refinery that the channel got blocked not in 1964 but after the monsoon in 1967. The reference to the diagram in paras 90 and 91, it is urged, relates to the period after the incident. To our minds also this appears to be correct. The said paras are not happily worded. Reading the above paras without reference to the diagram would convey the meaning as urged by the lawyer for the Monghyr Municipality and the Bihar Government. But we are not prepared to agree with them that the channel got blocked in 1964. On the other hand, a careful reading of paras 90 and 91 would show that blocking of the channel on the down-stream was done by the refinery after the incident to prevent the effluent flowing into the dead channel and the refinery also stated that the effluent was being discharged as a remedial measure through a new channel to enable the effluent to get mixed with the Ganges after flowing through a shorter distance.


APPENDIX. 2.
REFERENCES.
GRAVITY MAIN TO RIVER AB
PUMPING MAIN FROM SEWAGE TREATMENT PLANT TO RIVER CB
GRAVITY MAIN FROM COLLECTOR NO 3 TO SEWAGE TREATMENT PLANT DC
FECAL SEWER FROM TOWNSHIP EC
FECAL SEWER FROM REFINERY FC
SEWAGE TREATMENT PLANT C
N
GANGA RIVER
INDEX PLAN
BARAUNI REFINERY PROJECT
SKETCH SHOWING REGIME OF THE RIVER DURING THE PRESENT (1960) DRY WEATHER
SCALE :- 1 MILE TO AN INCH
DRAWN P.L.V.
CHECKED
SD. H. SHARMA 7-6-61
JOB NO. R/6/170
SR. CIVIL ENGINEER (P. H.)
DATE 7. 6. 61
DRAWING NO. SP/164


ELEVATION
PLAN
FLAP VALVE ELEVATION
RIVER OUTFALL

In our opinion, after the monsoon of 1967, when the river receded the channel got silted but nobody seems to have noted this fact. Further when it was found that the river had travelled away from the left bank at point 10B what prevented the refinery to extend the channel to put the effluent directly into the live current which it did in March 1968 soon after the Court directed the refinery to stop the effluent flowing into the dry bed. We are sure if there had been regular check of the channel and the pipeline the calamity would have been averted. During the course of the argument, great stress was laid by the refinery lawyer on the warning given by one of us Shri Modak (as he then was) in his comment (BRD-96) to show that according to him also the approval of the Government of Bihar was defective. What is pointed out is that Shri Modak had clearly indicated there that the effluent discharged at point 10B may not be thoroughly mixed and dispersed into the river which was necessary for avoiding the creation of unsatisfactory conditions at and in the vicinity of the point of outfall.

It is, no doubt, true that it has been so pointed out. It must not, however, be forgotten that Sri Modak while pointing out that, had not only agreed to the selection of the spot to be the only available and suitable one but had made certain suggestions for avoiding those contingencies. We would like to reproduce the same. "It is felt that every year some temporary arrangements may have to be made to ensure that the effluent when discharged into the river gets thoroughly mixed with the river water and is led to the main current as quickly as possible without given any time to stagnate round, and in the vicinity of the point of discharge. Some solution of this problem will have to be evolved and this can be done after watching the behaviour of the discharged effluent and its capacity to get itself dispersed into the large body of water available for dilution." It must be noted at this stage that Sri Modak submitted his comments to the then Managing Director of the Indian Refineries Limited which will show that it was obligatory on the refinery to check every year to ensure proper mixing of the effluent with the river water.

Even if the refinery had followed the above suggestions and taken the necessary care, we are sure, this calamity would not have happened.

CHAPTER IX

CAUSE OF CONTAMINATION—contd.

CONSIDERATION OF THE POINTS OF DIFFERENCE BETWEEN THE VERSIONS OF THE MONGHYR MUNICIPALITY, BIHAR GOVERNMENT AND THE REFINERY AUTHORITIES ABOUT THE CAUSE OF CONTAMINATION WITH REFERENCE TO THE EVIDENCE

The Commission now proceeds to consider the points of difference between the versions of the Monghyr Municipality, the Bihar Government and that of the refinery authorities on the cause of contamination. Since the complaint mainly refers to the floating of oily and somewhat yellow mass, it has to be established first that all the floating mass is petroleum product. It is a common ground that petroleum polluant is derived only from Barauni Refinery. In the memorandum and the affidavit of the Monghyr Municipality there is a reference to Mr. Harnal, Deputy General Manager (Technical) mentioning about the Bata people discharging oil which fact is not stated in the memorandum of the refinery. To ascertain the truth or otherwise of the fact, the Commission inspected the Bata Factory on the morning of 19th October, 1968, and also called for the data from them to know whether any discharge as such was made by them. From the data supplied by the Bata Company it is clear that no oily matter of any form is discharged by them. There were also reports that some pipelines carrying petroleum products were crossing the river Ganges at the Rajender Bridge and that leakages from these pipelines might have been a source of oil found at Monghyr. To ascertain this fact also the Commission visited the Rajender Bridge along with the General Manager and the Engineer-in-charge of the pipelines on 16.12.1968 but did not find any leakages there. After considering the lay-out of the pipeline, its operation and maintenance, the Commission rules out the pipelines being a source of the oil found at Monghyr. It can, therefore, be safely concluded that the Barauni Refinery was the only source of the oily matter found on river Ganga.

2. Now, therefore, we proceed to consider firstly whether the floating mass was petroleum product.

Some of the samples of oily material collected from the Ganges at Monghyr and Kasturba Water Works were analysed by the refinery lobaratories and the results are given in Appendices E, G and H to the memorandum of the refinery. Some more samples collected during 3rd to 5th March, 1968, were submitted to the Commission by the Chairman, Monghyr Municipality, during their inspection visit to Monghyr in August 1968. At that time the Commission asked for a sample of the sand in sand-filters that was stated to have been contaminated with oil flowing with the Ganga water. On being told that a sample of sand was not collected and shown a heap of sand stated to have been the contaminated material removed from the sand filters, the Commission collected a sample of sand from the heap at a depth of about one foot. The samples of sand, oily material and oil water mixtures were got analysed by the Commission at the Indian Institute of Petroleum, Dehradun.

The sample of the sludge (scum) floating on the water near the suction line of the pump at the Kastaharnighat and collected on 2.3.68 by the Municipality showed 55 per cent oil content (App. E, p. 20); the sample of the scum from Jamalpur raw water pumping station contained 0.44 per cent oil (App. E, p. 20). The oil content of a sample depends much on the method of sampling. Since untrained persons were collecting samples by skimming from the surface, it is reasonable to expect high oil contents in the samples. Also, at Kastaharnighat, the floating material must have been sufficiently thick to enable an oil-rich sample to be collected. If water was pumped from an area where material containing 55 per cent oil was floating, the water being pumped from below the surface must have carried some oil, if not all, with it, depending upon the depth of the foot valve and the force of the pump suction. The samples of water at the suction intake of raw water pump at Kastaharnighat contained 12 ppm. of oil and the sample of discharge water from raw water raising main for the pump at Kastaharnighat contained 6 ppm oil and the sample of discharge water from raw water raising main at Kastaharnighat contained 20 ppm oil. The sample of filter water from water works contained 8 ppm. of oil. (App. E, p. 20). The sample of sand collected from the sand heap by the Commission, 5 months after the incident, contained 0.26 per cent (wt) of oily material (by Soxhlet extraction with benzene), although by outward appearance and touch, it did not show any oily film or smell. (I.I.P. Test report, Sample No. R. 0341/20). Perhaps the oily material was absorbed on the surface of sand particles and was of waxy nature.

Normally there should not have been any oil in the water at the suction point or the discharge point or the water works. It is significant that all these water samples were collected on 4.3.68

at Monghyr by the refinery chemist and engineers who are well trained. The fact that the oil content in the water after the pump was 6 ppm whereas the oil content in water sample from the raising main from a point much after the pump was 20 ppm and the fact that both these samples were collected on the same day and in a short interval, show that the contamination on the previous two days must have been much higher, resulting in coating of the inner surface of the pipe with oil.

The foregoing analytical data together with consistent statement, from several observers belonging to the Monghyr town and refinery that the water from near Kastaharnighat was smelling of kerosene oil, clearly establishes that the oily material found floating at Monghyr on 2/3 March, 1968, contained petroleum product. It is now to be seen whether any other contaminant was admixed with the petroleum product or whether the floating oily material was wholly a petroleum product.

The sample (IIP test report, sample No. R. 0341/18) designated "sample of oily water taken from Ganges at Kastaharnighat water intake station on 3.3.68" and given to the Commission by the Chairman, Monghyr Municipality, when seen in the bottle, contained three layers floating on water: one top layer of dark brown oil; second lower layer of finely dispersed, dirty brown, emulsified sludge; and third lower layer containing agglomerates of the same brown material as in the second layer; finally the fourth layer of slightly dirty water. Analysis of the total sample as received, showed 34.6 per cent oil, 58.7 per cent water, 0.2 per cent sludge and 6.5 per cent agglomerated material (all percentages by weight). The analysis of agglomerated material showed below 0.06 per cent (wt) of sulphur and 0.58 per cent (wt) Nitrogen. If the floating material was wholly a petroleum product, there should not have been such high nitrogen content. Even if the petroleum product weathers under atmospheric conditions and forms some sludge and sediment, the latter should not have such high nitrogen and sulphur contents as were actually found. This clearly shows that the floating petroleum product was admixed, with some other material which contributed to the presence of nitrogen and sulphur. Such contaminant might have been either under-composed or partly decomposed fecal matter or other organic waste material.

The possibilities of the petroleum product, originating from Barauni Refinery, getting admixed with other organic contaminants containing nitrogen and sulphur will be discussed in a later chapter on "Technical Consideration". For the present, it can safely be concluded that the floating oily material was mostly a petroleum product with organic contaminants from other sources.

3. The next point to be considered is what was the likely quantity of oily material found on the Ganges at Kastaharnighat, Monghyr and upstream and whether the refinery was discharging sufficiently large quantity of oil into the effluent that could lead to the pollution of waters at Monghyr as alleged by the Monghyr Municipality and Bihar Government or was it within the prescribed limit.

In order to prove that large quantity of oil was discharged by the refinery, the Monghyr Municipality relies on the report of enquiry made by Sri M. K. Roy, Inspector of Factories (Chemical), Bihar, BGD 5, enclosure of Annexure IV, dated 22.3.1968. Enquiry report by Sri Maheshwari Pershad, Inspector of Factories, Monghyr, dated 26.3.1968 (BGD-4), original log book of Sector 6 maintained by Electrical Department, BRD 1, from November 1967 to March 1968 (S. No. 11 of Annexure IV), Memorandum of Monghyr Municipality, original log book maintained by Chemical Laboratory BRD 14 and 16 of Sector 6 from November 1967 to March 1968 (S. No. 12 of Annexure IV), Memorandum of Monghyr Municipality, original log book of effluent pumping station from November 1967 to March 68, BRD 18 (S. No. 13 of Annexure IV) Memorandum of Monghyr Municipality, report by Sri Tuli (BRD 28) relating to Sector 6 marked 'B' dated 27.9.1967, note of Sri Tuli, marked 'C' (BRD 29) dated 8.1.68, inter-office Memos marked BRD 30 and BRD 62 (A to X of CW 12). Another inter-office Memo BRD 74, dated 12.1.68 of Sri Puri, CW 11. Daily operation report marked BRD 31, daily operation report of water supply division, BRD 34, from 2.2.68 to 5.3.68, ATF going off specification, (the fear of the same being found to be of flow quality by the inquiry Commission) and the oral testimony of MMW1, MMW2, MMW3, CW 1 and the various affidavits filed. The Bihar Government also supports this stand of the Monghyr Municipality whereas the contention of the refinery authorities is that no free oil or excess oil was ever let out from the effluent and the discharge was within the permissible limits. The permissible limit is 50 ppm which is not denied.

The report of Sri Roy, Ex. BGD 5, shows that the oil content in the waste leaving the separators, the guard basin, the drain leading to the central sewage pumping station and at the discharge point was more than the different standards for oily wastages to be discharged. He further opined that the refinery had negligently or otherwise discharged excessive amount of oil in the waste drains leading to the river Ganges. To the same effect is his evidence on oath. On a question being put to him as to how much oil had exceeded its limit, he stated about 4 times. According to him fire at Monghyr was due to oily discharge from the refinery. From the questions put in cross-examination by the learned lawyer for the refinery drawing the attention of

the witness to the procedure and rules for taking samples the Members of the Commission got an impression that since this witness has not followed the procedure and rules, the samples taken by him cannot be accepted as giving a correct data of the oil contents in the discharged waste. At the time of the arguments no reference was made to this point. But since there was a lengthy cross-examination on this point we think it proper to dispose of this point also. It is true that the witness has not followed this method of taking samples but he has said that the method adopted by him in taking the samples was equally good. Having regard to the fact that the witness has long experience, his evidence cannot be ignored merely on the ground that the method adopted by him was not according to the prescribed rules if this gets support from other evidence on record. As regards the correctness or otherwise of his statement that oil had exceeded 4 times the normal limits we have to judge it in the light of technical consideration of the conditions preceding the incident which shall be discussed in a subsequent chapter.

Next document is the inquiry report of Sri Maheshwari Pershad (MMW 2), Ex.BGD 4—in his inquiry he has found that heavy quantity of oil was discharged which might be due to the non-functioning of the oil separator unit from 23.2.68 onwards, or the discharge of oil through fecal sewage drains direct to effluent pumping station. He has based his conclusion on the entries in the log books seized—Ex. BRD 18 and the analysis report of the treated effluent, Ex. BRD 15. He has also said in his report that during his inquiry he found that the effluent was flowing on dry sandy bed and had taken the shape of a channel. The witness on oath has confirmed his report. This witness also was cross-examined at length about the rules and procedure to be followed for taking samples. By this cross-examination, the Members felt that the learned lawyer wanted to impress on us that since the standard procedure and rules for taking samples has not been followed and he has not taken the samples himself, the readings of the samples taken by Sri Roy cannot be relied upon. It may be noted that at the time of the arguments no mention was made regarding this point also. But as stated earlier because of lengthy cross-examination we would like to dispose this point also. It may be noted that this witness while stating that he did not take any samples has said that in his presence Sri Roy took the samples. The credihility of his evidence would also depend as to how his statement and that of Sri Roy get support from the other evidence and on technical consideration which will be discussed subsequently.

The other set of documents is the log books.

BRD 1 to BRD 45 are the extracts of the entries of the log books maintained by the Barauni Refinery showing the entries made by various Foremen and Operators for the period from November 1967 to March 1968. All these documents are admitted by the refinery. It is also admitted that entries in the log books are made by the Foremen or the Operators in the regular course of their normal duties:

1. BRD 18, Ex. I, D/21.12.67—It shows: "pani key sath bahut tel aata hai. Pani aur tel dono pump hua". (Pump No. 9).
2. BRD 44, Ex. C, D/21.12.67—It says: "it was reported by the Operator of EPS that the oil is coming with sewage discharge water and accumulating in pump bay."
3. BRD 18, Ex. H, D/28.12.67—(Pump No. 9). Is men pani key sath tel bahut aata hai.
4. BRD 44, Ex. E, D/24.12.67—"That oil and water is coming back to 525 pit as there is no place to store the oil; so there is no benefit for skimming oil from guard basin."
5. BRD 44, Ex. F, D/25.12.67—Shows: "oil content both 40—45 ppm (Appx) DEE asked to stop the oil skimming from Sector 7 as the oil is going to guard basin."
6. BRD 44, Ex. I, D/10.1.68—"As per telephonic message from EPS that oil is coming with water."
7. BRD 3, D/11.1.68 (1 shift)—"Rakchit pokher 3-4 bhag pani aur 1—4 bhag tel bahir ja raha hai. Esleay dono rakchit pokher say tel koop men leyna shuru keya."
8. BRD 3, Ex. B, D/12.1.68 (2—10 shift)—Tank shankya teen sey pani ewam kachra bahakar tankey shankya barah mey tel bhejna awashyak hai. Rakchit pokher sey tel nal koop mey lekar tanki 1 aur 1 ko bharna hai, kianki rakchit pokher sey atyadhik tel Ganga men jaa raha hai ....."
9. BRD 18, Ex. G, D/12.1.68 (pump No. 5)—"Pani key sath tel bahut aata hai."
10. BRD 1, Ex. B, D/12.1.68—Shows: "tel bahut Ganga men jaa raha hai."
11. BRD 1, Ex. B, D/13.1.68—Shows: "Guard basin No. 1 bhag aike aur doo chalte hain tatha syphon dara tel bahut Ganga men ja raha hai kainkey tel aur kichad bahut jyada ho gaya hai."
12. BRD 1, D/16.1.68 (1st shift)—Guard Basin say Ganga men khub tel jata hai koe dhek bhal karney wala nahi hai."
13. BRD 5, D/9.2.68 (1st shift)—It is being suspected that some oil is going to Ganges.
14. BRD 3, D/20.2.68 (Ex. P) (1st shift)—No pumping as all the tanks are full.

15. BRD 18, Ex. A, D/23.2.68 (Pump No. 1)—"Aaj char bajey sey sirf tel aa raha hai."

16. BRD 18, Ex. C, 23.2.68 (Pump No. 6)—"Aaj char bajey saberey sey sirf tel aa raha hai."

17. BRD 18, Ex. D, 23.2.68 (Pump No. 6)—"Aaj char bajey saberey sey sirf tel aa raha hai."

18. BRD 2, Ex. A, D/24.2.68—7. Received a telephonic message from EPS that a lot of oil is coming to EPS. Personally visited EPS and found oil is passing to EPS. Immediately a sample* was taken from out-going Guard Basin. But no oil was found flowing from Sector 6. TPH out-let was checked. Shift D.H. also informed.

Ex. A, D/25.2.68—N.S. I/c: 3. Reported from EPS that too much oil is passing to that pump house. Checked at out-going side of Guard Basin. Found oil was passing with water. A sample has been taken. Informed S.F/m O.M. & S., Mr. Hyder as well as XEN W/E ch.op. Sri Misra was also there. Again visited Sector 6 (guard basin) and found oil was passing XEN also seen. Oil dip was taken with the help of Ch. Op. and found 90—100 cm. of oil in each section.†

4. Oil separator No. 22 was found full of water in the morning. Nothing has mentioned about it (whether cleaning water is over and the sludge has been cleaned from the bottom valve pit or not). That is why oil is passing. Oil level was at Guard Basin:

No. 2—100 cm.—21 cm.

No. 3—75 cm.—22 cm. as per Chemical Operator.

19. BRD I, Ex. E, 25.2.68—"G/B No. 1 discharge was checked at 12 noon and oil was found going to Dhat & Co. Pump House. Sample was taken.

1st shift—At 1 p.m. Mr. Gupta and S/F Mr. Nair visited the discharge and seen the situation.

The discharge of G/B No. 1, Part 2, is somewhat reduced, as there is much oil in Part 2 G/B No. 1. The H1 (525) does not stop itself when the level of the pit is lowest.

2nd shift—E.B. No. 1 ka dono inlet gate valve band hai. Discharge bhi band hai. Koyee operation bina permission key nahi karna hai.

Night shift—Karya Sankhya 525, Pump sankhya 1, swachalit had thatha teen asthaniya dasha mey chal raha hai. Pump No. 2 abhi marammat me hai. Guard Basin bhag 1 aur 3 chalu hai. Bhag 1 pura bhar janey key wajah se pratah 4 bajey bhag 3 bhi chalu kiya gaya... Appat pokher bhag 1 aur 2 band hai. Pitchle pali se tatha satah pani tel ka pura hai.

20. BRD 3, Ex. D, 25.2.68—Pratham pali ke operator se maloom hua ke rakchit pokher No. 2 aur 3 se tel ganga me ja raha hai. Rakchit pokher 2 aur 3 ka tel map pali pradhan evam electrical ke XEN Gupta ke samakchh liya evam nishchit kiya gaya ki dono rakchit pokher se tel sankat kaleen pokher 1 aur 2 ham logo ke andar me hai. 3 baje dono—rakchit pokher 2 aur 3—ko set down kiya gaya evam 1 ko chalu kiya gaya. Dono rakchit pokher se tel koop hotey huye dono sankat kalaeem pokher me liya jaa raha hai aur sab purb bat hai.

Note: Bibhagiya Adhyakchh Evam Pali pradhan ka adesh hai ki dono rakchit pokher se adhik se adhik tel sanket kaleem pokher me ikatha kiya jana chayiye (2—10 shift).

21. BRD 5, Ex. F, D/25.2.68—Hence it is clear that mud which is deposited here and is in fluid stage is the cause of oil going with water to the effluent line. (2—10 shift).

22. BRD 3, Ex. K, D/25.2.68—Tank No. 1, 2, 3 and 4 ka pani niskasit kiya. Rakchit pokher se tel Ganga me ja raha hai. Yaha baat pali pradhan ko suchit kiya. (6—2 shift).

23. BRD 1, Ex. G, D/27.2.68—Bhag 3 ka sample liya gaya, ab tel Ganga me nahi jaa raha hai. (1st shift).

24. BRD 2, Ex. D, D/2.3.68 (1st shift)—"In the morning Mr. Tuli and Shift D. H. visited Sector 6. The Magistrate of the locality has been reported that oil is going to the Ganga. So they came to inspect the site. Samples from discharge of Guard Basin and discharge of EPS pump has been taken. But no oil has been found. I think this report has come for the oil flowing in the Ganges from 24.2.68 onwards which has been duly reported."‡

MM1 deposes to the entries in BRD 1 B, BRD 2A to D, BRD 3G & H, BRD 4A to C, BRD 5A to H, BRD 9 and BRD 10A and B. Sri P. K. Misra, Sri Mandal, Sri Puri, Sri Ram Sudhisht Kumar, Sri B. D. Gupta, Sri Tuli, Sri Hyder and Sri Balwant Singh and Sri V. N. Misra also speak to these entries.

*Sample shown to XEN, AE/Mr. Nair, *B.D.G.*

†Noted and action taken at 1.30 um. *B.D.G.*

‡ Tried to contact DEE not available.

Sri Sudhisht Kumar, Operator as CW 1, on being questioned by the Chairman of the Commission whether he has entered in the log books that lot of oil was passing and how many such entries he made, stated that he has made such entries many times and are correct. He has identified all his entries. When cross-examined by Sri Misra why he did not make any entry that oil was passing on the subsequent dates, *i.e.*, 24th to 28th February, 1968, he stated that he was threatened by Sri B. D. Gupta, CW 2, Electrical Engineer, that if he made such entries he will lose his job and so he did not make any entry to that effect. He admitted having spoken to the Minister, Sri Raghuramaiah (CW 8) also that only oil was passing. Sri Raghuramaiah CW 8, admits one operator making such a statement to him. Shri Balwant Singh, CW 6, ex-General Manager, also says that in his presence Sri Raghuramaiah had asked an Operator. Though Sri Raghuramaiah has not said looking at CW 1 that he was the person but says he spoke to him. The other operator (CW 13) has not said that he was asked by the Minister. It has not been brought out in cross-examination that the Minister spoke to any other operator. It is, therefore, clear that CW 1 is the person who spoke to CW 8. In cross-examination by the Barauni Refinery advocate, he was asked whether he was one of those on whom notice for retrenchment was served by the refinery and whether he has handed over some documents of the refinery by accepting Rs. 5,000 as bribe by Sri Misra. The witness has denied both these suggestions. The refinery advocate excepting putting bald questions has not taken any steps to substantiate the allegations that he was a member of a Union or that he was bribed. Ex. BRD 40 and BRD 42, copies of the Memoranda of settlement of disputes between the management of M/s Indian Oil Corporation Ltd. (Refinery Division), Barauni Refinery and their workers, dated 7th October, 1967, and 10th June, 1968, respectively do not contain the names of the workmen and no list is attached to it to show that CW 1 was also among those workmen who had a dispute with the management.

In the absence of any material it is difficult to ignore his evidence when it gets support from the entries in the log book and the evidence of other witnesses. From the questions put in cross-examination by the lawyer for the refinery, it appears he wanted to impress on the Members of the Commission that if what he has stated is correct that from 23.2.1968 to 28.2.1968 oil was passing he would have made entries in the log books similar to the one he made on 23.2.1968. The witness has said that since he was threatened by the Electrical Engineer, Sri B. D. Gupta, he did not make any entries. Sri B. D. Gupta, as CW 2, has denied having threatened him but the way Sri B. D. Gupta has given his evidence and even gone to the extent of not only denying but giving twisting and evasive answers to the entries made in the log book and other relevant matters pertaining to the working of the various units, it gave an impression to the Commission that he was not speaking the truth and was giving evidence under some influence. This gets further support from the fact that in reply to the question put by the Bihar Government advocate he stated that the entries in the log books are either guess or the opinion and when he was asked to read the entries and show which portion was opinion and which was a fact, the witness had to admit that excepting the portion: "this is why oil is passing" which is his opinion, rest was all fact. When questioned further whether he admitted its correctness he at one stage stated he believes those entries but does not agree with them. When he was asked to give reasons for not agreeing he did not give any clear reply. We are very much constrained to note that an officer of his rank should speak in such a manner. It does not become of such officers. We are at a loss to understand what prompted him to give such a statement. We cannot, therefore, rely on his deposition. CW 1 was further confronted by the refinery lawyer with his earlier statement before the police, Ex. BGD 2, wherein he had stated that he was threatened by Sri B. D. Gupta and Sri G. S. Gill and asked whether that was correct. He deposed that he did not mention the name of any one excepting Sri B. D. Gupta.

It is very strenuously urged by Sri Baldev Pershad Singh that when CW 1 has admitted that he did not adopt the scientific method of taking dips and samples, his entries in the log books that "bahut tel" or "sirf tel" 'ja raha hai' can be nothing more than a guess as it is not possible to know the quantity of oil by mere vision of the eye. It is, no doubt, true that by the vision of the eye it is not possible to judge the quantity of oil; but when he has been seeing the pits every day and noting them it can safely be said that what he means by those entries is that more than the normal quantity of oil or sometimes only oil is passing.

It may be noted that when CW 1 was questioned by the Members of the Commission as to how he knew oil was passing and whether he took any sample he stated that he did take samples frequently in an ordinary drinking glass by opening the cork fixed on the delivery pipe of the pump and thus he could easily see the extent of oil in the contents of the glass. In order to know the truth of this statement, the Members of the Commission visited the EPS, got down into the pump pit and found that what he said about the collection of sample was quite feasible. Also the method of collecting sample from a sample cock on the delivery pipe is quite a normal procedure. Thus on the mere ground that the scientific method has not been adopted his statement should be ignored cannot be accepted. In this connection, we would like to point out that this method of seeing by vision is one which is not only adopted in the Barauni

Refinery but in the other refineries of Burmah Shell, ESSO and Cochin also and when the Members of the Commission, while on inspection of those refineries, put questions to the managements they while accepting that the thickness of an oil layer cannot be stated by visual observation said that this method was quite satisfactory and could normally be used by trained operators. At the time of his deposition the Members of the Commission noticed the demeanour of CW 1. He appeared to be a truthful witness. His evidence gets support from the consistent entries of the log books which also speak of huge quantity of oil being discharged and there is no reason to disbelieve him. We are not inclined to believe the version of the refinery that he is deposing so merely because he was about to be retrenched or that he has been bribed.

Sri K. P. Tuli, CW 3, when asked about the entries in the various log books and what meaning should be given to the words used stated that as far as they write they must be correct. But as to the truth of its contents he simply said that that was a matter of interpretation and opinion.

Sri G. S. Hyder, CW 4, while stating that readings and statements in the log books should be believed has refused to accept the correctness of some of the entries showing that oil along the effluent was flowing into the Ganges by merely saying that he does not agree. On a question being put by the advocate for the refinery whether there were any written directions as to what has to be written, when to be written and under what heads, he stated that there were no written instructions nor any pattern provided. He even went to the extent of saying that entries are made according to convenience and their notions and if he does not make entries showing details he cannot be taken to task. When he was pointedly asked to show which portion of the entry was opinion and which was fact he had to admit that all except the words "oil was passing" was all a fact.

Shri K. P. Mandal, CW 9, Shift Foreman, when asked about the entries in the various log books made by him or the other operators and Foremen very clearly stated that whatever entries he has made are correct and that he made those entries of what he saw and did. As to the entries of the others also he stated that they were correct. He has identified all the entries in the various log books.

Shri T. S. Rao, CW 10, when asked about the entries in BRD-18 stated at p. 940 (ER) that those entries were correct and he identifies them.

Shri Y. D. Puri, CW 11, while admitting that the Operators and the Foremen have made entries in the various log books has denied their correctness and refused to accept the factual position of those entries by saying that it is their imagination and optical illusion and he does not believe them as it is not possible for oil to pass to Ganga. When he was asked to give reasons why he does not believe he gave evasive replies and sometimes even went so far as to deny his own writings. We shall comment further about his evidence when we discuss his inter-office Memo, BRD 74, dated 12.1.68. Anyway it is difficult to rely on his evidence.

Sri Balwant Singh, CW 6, ex-General Manager, Barauni Refinery, has admitted that whenever an operator notes in the log book "tel ja raha hai" it must be taken as correct because he does so after seeing and taking the dips.

Shri V. N. Misra, CW 13, another operator, stated that entries in the log books made by him or other operators or Foremen are all correct as they are made by them of what they see and do.

The trend of the questions put to the operators, the Foremen and the top engineers by the learned lawyer for the refinery relating to the entries in the log books, the method of taking dips and samples and judging the contents by vision shows that the learned lawyer wants to impress on the Members of the Commission that the entries in the log books were most undependable and unworthy of any credit. The Members of the Commission do not agree that the entries in the log books are undependable or unworthy of any credit. The entries in the log books are made regularly by every shift operator and Foreman of what they see and do and are checked by the higher officer. These entries are admittedly made in the regular course of their normal duty. The Commission further finds that the entries made in the log books are not only detailed but also indicate a sincere attempt on the part of the Foremen and the Operators to record regularly the operations and the observations made during their shifts. If these entries were a mere illusion or were incorrect according to the top engineers, Sri Tuli, Sri Puri, Sri B. D. Gupta and the Foreman, Sri Hyder, we cannot understand how the management could allow such a situation to continue and not correct it but go on acting on those entries. If the above statements have to be accepted we will have to conclude that all the dips readings are erroneous and consequently all production data. We, the Members of the Commission, are not prepared to accept such a situation. These officers seem to be under a mistaken idea that by saying that the entries in the log books are incorrect or that they do not agree or that they are mere illusions or guess work they would be escaping from their responsibility which lies mainly on them.

As against the statements of Sri Tuli, Sri Puri, Sri B. D. Gupta and Sri Hyder, there are the statements of Sri Balwant Singh, ex-General Manager of Barauni Refinery, Sri T. S. Rao, Sri Mandal, the Foreman, Sri Ram Sudhisht Kumar and Sri V. N. Misra, the Operators, who have very clearly stated that the entries made in the log books are all correct being made by the Operators and the Foreman of what they see and

do. We are not prepared to accept the statements of Sri Tuli, Sri Puri, Sri B. D. Gupta and Sri Hyder. Accepting the statements of Sri Balwant Singh, Sri T. S. Rao, Sri Mandal, Sri Ram Sudhisht Kumar and Sri V. N. Misra, we hold that the entries in the log books are correct and have to be relied upon.

Annexure marked 'A' (BRD-27) is a copy of the order of Sardar Balwant Singh, General Manager, dated 28.9.67 forwarding a copy of the Production Engineer's note, dated 27.9.67 embodying his suggestions for improvement in Sector 6, for examination and processing of necessary action to remedy such defects as may concern the Mechanical Engineering Department. MMW 1 speaks to this document. Shri Tuli, as CW 3, admits having sent a note, dated 27.9.67 to the General Manager. Sri Balwant Singh, as CW 6, also admits having received the note and the same being forwarded.

Annexure 'B' (BRD-28) and Annexure 'C' (BRD-29) are the notes of Sri Tuli, Production Engineer, CW 3, dated 27.9.67 and 8.1.68 respectively. It is better to reproduce them.

COPY OF OMS(R) MARKED 'B': REPORT ON SECTOR 6

The worsening position of Sector 6 as has been prevailing in the past is quite evident and well-known. Many a times emergencies have been created by sudden influx or huge quantity of oil and water coming to Sector 6 which continues to be in bad condition and invariably creates crisis and constitutes an operational limitation as well as a hazard in this refinery. Of course, some of these problems could be traced back to inherent deficiencies in the design because the capacity of the various equipments and flow patterns, etc., have been undersigned or rather ill-designed. Further more, many of the Sectors and provisions were not envisaged and thus not taken into consideration. So much so, no provision had been thought of or provided for the storm rain water, which during monsoon period results in flooding of the oil separator area and thus renders the oil recovery system and water pumping out to the Ganges inoperable and inefficient. It will also be pertinent to mention that the water leaving the refinery is heavily contaminated with oil which in any country or society will not be permitted. It is high time that Sector 6 is thoroughly revamped taking into account the increased flow of oil and water coming to this area so that oil recovery system may be improved which itself will pay of by way of increased recovery of oil for subsequent reprocessing in this refinery. Also it will mean less pollution of the Ganges water, which as such is also our responsibility to ensure that the oil content in out-going water is maintained within permissible limit.

Given below is a list of jobs by way of civil and mechanical work which may be examined, studied and elaborated so that our oil recovery system may be put on a sound footing for the benefit of operations in this refinery.

Already civil work for providing drainage in this area has been undertaken under instructions of the General Manager. The drainage facilities will be reviewed after the monsoon period is over when we expect to be better acquainted with the problems and difficulties presented during heavy rains in this refinery."

Sd. K. P. TULI
Production Engineer
27.9.67

NOTE 1: This letter contains a list of jobs for which see Appendix.

NOTE 2: On this note there is an endorsement by the General Manager to the Deputy General Manager (T) for taking action.

B.R.D. 29: PROCESSING OF SLOPS IN AVUs

The high inventory of slops in the refinery has been a serious problem for a long time which, in turn, creates emergency condition in Sector 6 as well. So much so, the high level in guard basin constitutes a danger of water going out with oil beyond permissible limit to the effluent services and subsequently to the Ganges. This, in short, creates a series of problems and we constantly endeavour to process the maximum possible quantity of slops in AVUs by way of bleeding from the slop tanks along with the crude feed to AVUs.

2. At present there are two storage tanks (tank Nos. 11 and 12) having capacity of 5000 M^3 each; which are being used for the purpose of collecting slops from Sector 6 and preparing these slops for processing in AVU and it takes minimum one week to prepare one tank before it can be bled into the crude feed to AVUs after steam heating, draining of water and emulsion, etc.

3. *Limitation to processing of slops in AVUs*: While this one tank is being prepared for bleeding, the other tank is actually bleeding to AVUs at a particular rate. But whenever this slop tank's level goes down, bleeding has to be stopped due to the fact that gravitation takes place from the crude feed tank to the slop tank. So the bleeding from the slop tank is restricted for a few hours in a day when the feeding tank is of the same height or less in the slop tank.

The slop rate has to be adjusted according to that of the crude feed with the maximum limit of 5 per cent; otherwise the Unit operations get seriously affected and emergency conditions are created.

4. We are experiencing difficulty in reducing the inventory of slops as the amount being processed is not sufficient as compared to the amount of slop being received from different units because of the frequent shut-down, start-up and

other emergencies in the various units. By experience it has been found that the bleeding time is limited to a few hours only and inspite of our efforts, AVU is not able to process more than this quantity. However, this problem may be studied by the process department and we should be advised as to how the slop inventory may be possibly brought down.

5. *Suggestions*: As per the present arrangement, the slop connections are provided in tank Nos. 11 and 12 only and none of the other crude oil tanks has provision for receiving the slops into the respective tanks. It is, therefore, suggested that the slop lines should be extended to all the crude oil tanks so that certain percentage of slop can be taken in each tank before receiving the crude oil from Oil India in respective tanks. This will ensure mixing up slop with the crude oil and will have the added advantage that slops can be taken in all the crude oil tanks and this will eliminate necessity of preparing the slop tank for eventual bleeding along with the crude oil to AVUs. The present procedure of preparing the slop tanks is too cumbersome, time-consuming and presenting numerous problems due to limited number of slop tanks.

This suggestion will go a long way in solving most of the problems pertaining to processing of slops, controlling and reducing the slop inventory in the refinery and improving the operations and conditions of Sector 6.

We understand that this suggestion has already been accepted in practice and we wish to impress the urgency and necessity of implementing this suggestion without further delay. The problems pertaining to slop inventory and conditions in Sector 6 including the oil content of effluent water is linked up. Also some of the slop tanks (400 M^3 each) need cleaning and repair of steam coils.

Sd. K. P. TULI
Production Engineer
8.1.68

The following points emerge from these notes:

1. The condition of Sector 6 was very bad sometime before September 1967 till at least January 1968;
2. there were inherent deficiencies in the design;
3. various equipments and flow patterns have been under-designed or ill-designed;
4. water leaving the refinery was highly contaminated with oil;
5. Sector 6 should be thoroughly revamped so that the recovery system may be improved which will mean less pollution of the Ganges water; and
6. to ensure that the oil content in out-going water is maintained within permissible limit.

Sri K. P. Tuli, CW 3, was asked about this note (BRD 28). He while admitting having sent this note has denied the correctness of the contents by saying that he sent this note being misled by the baseless and wrong information given to him by the people under him without understanding the implications. He was subjected to very severe cross-examination by the learned advocate for the Monghyr Municipality and the Bihar Government. The Members of the Commission also were forced to put lot of questions to elicit the truth from him. From the way he has answered the questions in cross-examination and the questions put by the Members of the Commission we say without hesitation that the witness was not speaking the truth and was trying to give evasive replies. We cannot understand how an officer of his rank and competence, a responsible person of the refinery, could give such a statement. When questions were put to him item by item relating to the points raised by him in the notes he not only tried to give twisting and evasive replies but went to the extent of saying that what all he has said in the notes is wrong. He admitted that within a week of writing the first note he came to know that the information given to him was wrong and when asked by the Members of the Commission whether after coming to know that, he tried to withdraw that note or go and inform the General Manager or the Deputy General Manager that that note was based on wrong information and therefore no action should be taken he said that he did not inform the General Manager nor did he withdraw the note. He, however, admitted having talked to the Deputy General Manager and when asked what he said about this note he said it was not discussed and was side-tracked. The note, it may be noted, is still in the record of the refinery. It is a very damaging document so far as the refinery is concerned. What all has been stated in this note and the other note is also found to some extent in the note of the General Manager Sardar Balwant Singh, dated 13.9.1967—Ex.BRD 92, which reads: "Sector 6 has been in bad shape for some time and any continuous rain will result in flooding the place. So far we have not had any occasion on which things have gone beyond our control but we have been reaching the breaking point on some occasion and the matter is well-known to officers concerned. Of late, I have been impressing upon D.G.M.(T), C.E. and C.M.E. that we should take all steps to see that there is alertness and we are not caught napping. All the pumps should be kept in full trim and water is quickly drained from the sector. I have thought of reiterating this position as I attach great importance to this urgent work. Keeping Sector 6 in trim would involve keeping all the drainage pipes properly cleared and please ensure all necessary steps are taken in time to avoid any emergency."

When CW 6 was asked about the correctness of the contents of his note he stated that there

was a particular need for the note in view of the impending Hathia rains which would normally be heavy and which the refinery authorities were afraid, would flow Sector 6 units which are located in a low area. It was repeatedly urged by the witness and the lawyer that this note and the other inter-office Memos issued in September 1967 were intended to expedite preparations to meet the exigencies that might arise during Hathia rains.

The Commission thinks that it was quite natural for the refinery authorities to get prepared for the Hathia rains. But this alone in our opinion cannot be the reason for sending such report which not only points to the defects but say that there is the likelihood of larger quantities of oil going into the effluent.

When CW 6 was questioned whether what all he has said in the note was also incorporated in the note sent by Sri Tuli he had to accept that it was correct to some extent. He has also admitted that Sri Tuli had sent that note (Ex.BRD 28) after seeing his note but denied that there was any defect in the design and said that Sri Tuli had exaggerated the matter out of over-enthusiasm.

The defects in Sector 6 pointed out in the note of Sri Tuli and the other note of Sri Balwant Singh (BRD 92) are also found in the inter-office memos BRD 62 series beginning from 31st January 67 to 28th February 1968 and another inter-office Memo marked Annexure "D", dated 1/2-3-1968 (BRD 30).

Inter-office Memos BRD 30 and BRD 62 series were called from the refinery by the Commission on 23-11-68 which were supplied on 14-12-68 at Barauni. In all these inter-office Memos right from 31st January 1967 not only the condition of Sector 6 was shown to be bad but it was also said that the other units were also not properly working which resulted in huge quantity of oil being carried to the effluent pump house and there was the likelihood of the same going to the Ganges.

There is another inter-office Memo of Sri Puri, BRD 74, dated 12-1-68 which also points to similar defects in Sector 6 and the likelihood of oil going to the Ganges.

This Memo seems to have been written after the entry in the log book BRD 3B, dated 12-1-68.

Sri Puri, as CW 11, was asked about this Memo. He admitted having drafted the Memo and got it typed but denied having issued it and said all the copies are with him excepting the original which was given to Sri Tuli for reading. When he was asked how a copy of this Memo was filed by the Chairman, Monghyr Municipality, he said it might have been stolen by some body. On a further question about the correctness of the contents he not only tried to give evasive replies but went to the extent of saying that what all he has said there was all incorrect. He was also subjected to severe cross-examination and the Members of the Commission also were forced to put searching questions to him which the learned lawyer for the Barauni Refinery did not like and started challenging the right of the Members of the Commission to put such questions. He even went to the extent of saying that the Members had already formed their opinion and were putting questions so as to coerce the witness to admit. The learned lawyer for the Refinery forgets that the witness was called on behalf of the Commission and when the Commission found that the witness was not giving direct replies but was evading to answer questions the Members of the Commission, in order to get the truth, had to put searching questions. We have been marking the demeanour of this witness. The way the witness was giving his statement it appeared to us that the witness, due to some influence, was not speaking the truth and was trying to conceal facts by giving a twist.

The other witness is Sri Hajela, CW 12. He was questioned about his inter-office Memos BRD 62 series and another inter-office Memo BRD 30, dated 1/2-3-68 and was asked about their correctness. The witness while admitting having issued these Memos started giving evasive replies and when his attention was drawn to particular portions in the Memos, to some he stated that he had written that with emphasis to bring down the oil levels and to get repair works done on priority; to some he said that the words were used in a relative sense. When he was asked about the dips to which he had referred in his Memos he said he has exaggerated it and used those words only out of extreme caution; to some of the other portions in the inter-office Memos he stated that that was his impression. All the inter-office Memos issued by this witness refer to the bad condition of Sector 6 and the emergency basin, the oil separators and to the likelihood of oil going to the Ganges. Whatever this witness has said about the condition of Sector 6 is to be found in the inter-office Memo of Sri Puri, CW 11, the notes of Sri Tuli, CW 3, dated 27-9-67 and 8-1-68 and in the note of Sri Balwant Singh, ex-General Manager, CW 6. It can be safely stated that this witness being fully aware of the dangers inherent in the condition of Sector 6 was right from the beginning giving serious and repeated warnings to the higher authorities. But it appears that the authorities treated this matter very lightly. Thus it becomes clear that right from 30th January, 1967, till the day of the incident, *i.e.*, 2nd and 3rd March, 1968, the condition of Sector 6 was very unsatisfactory and there was always the danger of oil passing to the Ganges. There can, therefore, be no doubt that what Sri Tuli, Sri Puri and Sri Hajela had written in the notes and office Memos is quite correct. The statements of these officers in the box now that all that they had written was not correct is such which cannot be accepted.

We are very much constrained to note here that the strategy adopted by these officers of the refinery namely Sri Tuli, Sri Puri, Sri Hajela and Sri B. D. Gupta is to admit the documents, deny their contents, try to create doubt and make it difficult for the Commission to get to the truth. This sort of attitude was most unhelpful to the Commission. It is also curious to note that all the officers of the refinery sing the same song, use the same words. By this, an impression is created in the minds of the Members of the Commission that these witnesses have been tutored to give this sort of version. Whoever is responsible for tutoring is not only damaging the reputation of the refinery but marring the careers of the officers. All the above officers appeared to us to be very capable but it pains us to note that these officers have become a prey to influence. The Members of the Commission take a very serious view of the matter and hope that the management would hold an inquiry regarding their conduct before the Commission and take such action as it thinks necessary so that such things are not repeated and it may serve as a lesson to others.

The learned lawyer for the Barauni Refinery in his final arguments while dealing with the inter-office Memos of these officers of the refinery for the first time conceded that what all the officers had written in the office memos/letters should be taken as correct but contended that some of the officers specially, Sri Tuli and Sri Puri had training in USA and had no knowledge of the working of the Russian design which was in the refinery and without understanding the working of such design have written these letters. As regards Sri Hajela it was contended that he too had no experience of the Russian equipments. We are at a loss to understand the stand now taken by the learned lawyer. All along during the inquiry the stand taken was that these letters were written either on the wrong impression or wrong information given and these entries were not correct. Lengthy cross-examination has been made on these witnesses and there is nothing in the cross-examination to indicate the stand now taken. The officers have not said so. We are also not prepared to accept it for the simple reason that a refinery management would not entrust such technical handling to them if they had not known the working of the Russian machinery. It is also not pointed out what were the difficulties.

Compared to this the attitude of Major General C. N. Dass was most admirable and helpful. Whenever the Commission wanted any document or any assistance the General Manager never hesitated. He produced all the documents and never tried to withhold them. The Members of the Commission are very thankful to him. If the other officers of the refinery had also co-operated and come out with the truth and placed the true picture, the work of the Commission would have been completed much quickly and smoothly. In this connection, we would like to say something about the refinery lawyer, Sri Baldev Pershad Singh. His behaviour all along the inquiry, apart from not being helpful, was most distressing and sometime annoying. At every stage he has been changing his stand and the way he was putting questions to the witnesses it appeared as if he was defending an accused in a criminal case. His behaviour towards the other lawyers also was not quite congenial. We highly appreciate the behaviour of Sri Sinha who tried to assist his senior throughout the inquiry. The behaviour of Sri R. B. Singh, the learned lawyer for the Bihar Government was not only helpful but very commendable all throughout. At this stage we would like to say something about Sri Misra, the learned lawyer for the Monghyr Municipality. Appearing as a lawyer for the Municipality he adopted a partisan attitude associating himself with the Municipality and created an impression in our minds that he was not prepared to accept anything said and done by the refinery and always viewed its actions with suspicion. Excepting this he was most helpful to the Commission in finding out the facts. His extreme keenness is quite clear from the questions put by him in cross-examination even though sufficient questions were put by the Members of the Commission. This to some extent unnecessarily prolonged the inquiry. The Members of the Commission would, however, be failing in their duty if they do not appreciate his work as Chairman of the Monghyr Municipality. He has done commendable work to the country as a whole. If he had not taken the initiative this Commission would not have been appointed and things would not have come to light. On getting the information of the contamination of the water in the mid-night he not only went to the spot, saw the thing himself but also informed the higher authorities and tried to take all precautionary measures and find out ways and means to provide for the supply of water to the people. Besides this he tried to go to the truth of the matter and collect material as far as possible. In this way he has helped the working of the Commission. The Members of the Commission are very grateful to him.

CHAPTER X

CAUSE OF CONTAMINATION—contd.

DISCUSSION ABOUT FREEZING AND MELTING

Reading the entries in the log books BRD 1 to 45 series the reports of Sri Tuli, BRD 28, 29, the inter-office Memo of Sri Puri, BRD 74, the inter-office Memos of Sri Hajela, BRD 30, BRD 62 series, various affidavits filed showing oil being found on the surface of the river, the slow sand filter beds and the mechanical filter beds, storage tanks along with the oral evidence discussed above it becomes clear that the contamination at Monghyr on the 2nd and 3rd March, 1968, was due to the heavy discharge of oil by the Barauni Refinery from the beginning of December 1967 upto the incident and more particularly from 22nd February to 3rd March, 1968. As against this the refinery in its memorandum in Para 24 and the statement of Sardar Balwant Singh given at Barauni on 10-8-68, Ex. CWD 17, has set out the case thus:

> "that on account of the filteration effect of the sand, the water gradually seeped through the sand resulting in greater concentration of oil. Due to the slow movement of the effluent through the channel and practical stagnancy in the lagoon and the considerable settling time there was greater accumulation of oil on the surface which combined with the algae, weeds, etc. formed a waxy scum. The high pour point of this scum combined with low ambient temperature in winter possibly contributed to the increased formation of the scum which gradually drifted to the bank of the lagoon. At this period when ambient temperature rose in the end of February 1968 the scummy material disintegrated and helped by the wind direction gradually found its way into the main-stream of the river en-masse."

In other words, what is said is this, that contamination was due to the failure of the effluent to get mixed, diluted and diffused and there being no water there it got blocked in lagoons and bulk of it remained unmixed and due to cold got frozen and solidified and with the rise in the temperature it started thinning and floating and helped by the wind floated en-masse.

We have, therefore, to see whether the material placed on record is sufficient to hold that the contamination was due to the said facts.

At the outset we may point out that the refinery authority has not filed any affidavit of any of their officers who have seen such a thing happening nor is there any direct evidence. In these circumstances the Commission will have to search for circumstantial evidence which as pointed out by their Lordships of the Supreme Court in the case of Hanmant Govind Nargundkar *vs* State of Madhya Pradesh (1952 SC 345) should be of a conclusive nature and tendency and such as to exclude every hypothesis but the one proposed to be proved.

The contention of Sri Misra is that this theory of freezing and melting was not there till the 9th March and it was only on the 9th March when Sir Kashyap, Chairman, Indian Oil Corporation, accompanied by Sri Kurien and joined later by Sri Kumra visited Monghyr and held discussions that this theory was propounded.

In this connection our attention is drawn to the telephonic talk of the District Magistrate with the Barauni Refinery authority on the 3rd March, 1968; (2) to the visit of the Chairman, Monghyr Municipality, to Barauni on 4-3-68 and having a talk with Sri Harnal; (3) to the inspection of the channel by Sri T.S. Rao on 4-3-68; (4) to the visit of Sri Harnal and Sri Ayyar upto the point of channel on the 5th; (5) to the inspection by Sri Hajela and Sri Ayyar on the 5th; and (6) to the visit of Sri Kashyap with Sri Kumra and Sri Kurien on the 9th March, 1968.

In the telephonic talk of Sri Binod Kumar, I.A.S., District Magistrate, Monghyr, with the Barauni Refinery authorities on 3-3-68 when Sri Binod Kumar asked about the discharge of waste from the refinery, the refinery authorities denied any discharge of petroleum products into the Ganges. In this talk there is no reference to the freezing and melting of the accumulated oil. Even when Sri P.K. Misra, Chairman, Monghyr Municipality, met Sri Harnal on the afternoon of 4-3-68 what Mr. Harnal seems to have said was that no oil beyond the permissible limit was discharged. When he was questioned as to how such a huge quantity of oil has come to the Ganges he told them that some dealer of oil products might have thrown it or that Bata people might have thrown some refuse. In this talk also there is no reference to the freezing and melting of the accumulated oil. In the report of Sri T.S. Rao submitted on 12-3-68 of his inspection of the channel on 4-3-68 (Appendix C) of refinery memorandum there is no mention of any accumulation of oil and the freezing and melting of the same. On the other hand, what we find is that when Sri T.S. Rao, Sri Jha, Engineering Assistant and Sri Pandey, Security Inspector, went along the effluent channel from the outfall and walked about a distance of 1½—2 miles upto Dhurma village and Tirpana Thola they found the channel still flowing and by the side of it dark patches of brownish sand was noticed. In para 8 of the memorandum of the refinery

it is stated that the Deputy General Manager(T), (meaning thereby Sri Harnal), accompanied by the Chief Electrical Engineer inspected the refinery effluent pumping station at about 9.00 a.m. and also the point of effluent out-fall into the river Ganges and they did not notice any abnormality. It is only after this that, it appears, Sri T. S. Rao was deputed by Sri Harnal to undertake a thorough inspection of the effluent channel which he did on 4-3-68 and submitted a report (Appendix C) on 12-3-68.

On 5th March, Sri Harnal and Sri Ayyar again inspected the channel upto about the confluence of the channel with the Ganges after walking a distance of about 4 miles from where the point of confluence of the effluent channel with the Ganges was visible at an approximate distance of ½ a mile and found that the main-stream of water was free from oil and patches of oily material and sludgy stuff were observed near the banks at a number of places. In this para No. 10 of the memorandum of the refinery also we do not find any reference to the accumulation of oil and its freezing and melting. Then in the afternoon of 5th March, Sri C.D. Ayyar, Chief Electrical Engineer, accompanied by Sri Hajela, Deputy Electrical Engineer (P&U) and the Fire Marshal Tatiyalu, walked along the effluent channel cut into the sandy bed of the river from the outfall point and came to the same point which was visited in the morning at a distance of about 8 miles from the out-fall point of the effluent discharge main. These two officers do not seem to have seen any abnormality then. There is no mention by them of any weathered oil disintegrating or melting. They also do not refer to any obstruction. The District Magistrate, Monghyr, on 5-3-68 in the morning, accompanied by the Municipal Commissioner, Monghyr, the Sub-Divisional Officer and a few others visited the refinery. They had discussions with the Deputy General Manager, Sri Harnal, who informed them that the effluent water normally contains oil within the permissible limit and there was no possibility of heavy carry over of oil from the refinery. At this stage also there is no reference to the melting and freezing. On 9th March, the Chairman, Indian Oil Corporation, Sri Kashyap, accompanied by Sri Kurien, visited Monghyr and had discussions with the District Magistrate and the Chairman, Monghyr Municipality, Sri Misra, and it was at this meeting that for the first time we find that there is some mention of melting and freezing. When Sardar Balwant Singh, CW 6, was in the box, Sri Misra put a question to him about this melting and freezing whether it was not a fact that this theory was born on 9th March when he and Sri Kashyap arrived at the scene. In answer to this question, Sri Balwant Singh stated: "I formulated my views, others formulated their own views, of course, you are under-rating people's intelligence." Later on at pp. 850-851 (of the ER) he agreed that this suggestion was given by him. In BRD 21, report of Sri Kashyap, it is stated thus: "At Monghyr I saw deposits of rust coloured weathered oil along the banks and for some distance into the dried up areas much above the water-line in the effluent channel." He has also stated to have seen small accumulation of oil in shallow depressions. According to him they were of weathered nature and from that observation he came to the conclusion that oil had accumulated as a result of inadequate flow in the effluent channel, congealing of oil on surface on account of cold weather during winter months which had melted with the rise in temperature. The analysis report in respect of samples of water and sluice collected by the Chief Chemist, Barauni Refinery, on 4-3-68 at Monghyr (Appendix E), Analysis report of the sample taken on 6-3-68 (Annexure G) and analysis report of sample collected on 8-3-68 (Annexure H) cover only the general tests and not any special test to indicate the weathered nature of the oil. From the above discussion it becomes clear that till the meeting of the 9th March there was no clear statement by the officers of the refinery that the oil found was weathered oil or that the oil which was collected in the lagoons or the pools had got frozen during the winter and after the advent of summer started melting. But it may be noted that till 9th March, 1968, the officers of the refinery were still investigating into the possible reason for the accumulation at Monghyr and it was apparently Sri Kurien who first made a careful observation of the deposit on the sandy banks along the channel and indicated the likelihood of freezing and melting. It may be mentioned that Sri Kurien specially mentioned in his report as well as in his evidence that he noticed waxy patches melting in the warm sun.

In order to explain the phenomena of freezing and remelting of the oily matter in the effluent, the refinery authorities have relied upon the chart giving the data on maximum and minimum temperature from October 1967 to March 1968 near Mokahma Bridge (BRD 19) and contended that the general level of temperatures was gradually falling down from October 1967 to February 1968. They further pointed out that not only the maximum temperature of the day was falling from October 1967 to about 1st week of February, 1968, a more sharp fall was noticed in the minimum night temperatures from October 1967 upto about 19th February 1968. The coldest period as far as night temperatures were concerned was stated to be from about January 15 to about February 19, 1968. From the 20th February, 1968, the night temperatures started rising and the day temperatures started increasing more substantially. The refinery's contention is that due to the lowering of temperature from October 1967 to 3rd week of February, 1968 the oily products which were discharged along with effluent, due to their high pour point and absence of dilution in the effluent channel, got stagnated and during the cold night got solidified in the pools and lagoons of the effluent

channel. When the temperatures started rising from about 20th February, the solidified products started to melt and during the first two days of March when the maximum temperature in the day rose to 42°C on the 2nd March, 1968, the soft and melting material got completely disconnected with the sandy banks of the effluent channel and started floating away into the river and found itself accumulated at Monghyr on the second night.

Against this contention of the refinery, Sri Misra, Chairman, Monghyr Municipality, has contended that the maximum and minimum temperatures did not change substantially during the period from October, 1967 to March, 1968. In this connection, the attention of the Commission is drawn to the fact that the temperatures such as 25°, 26°, 28°, 29° and 30°C were observed not only in January and February, 1968, but also in October, November and December, 1967. He, therefore, argued that if freezing and melting had taken place in January and February, 1968, it should have taken place in October and November, 1967 also. Shri Misra, further argued that the freezing and melting theory was an after-though of the refinery authorities to cover up large discharge of oily products prior to the incident. The Bihar Government substantially agreed with the argument of the Monghyr Municipality in this regard.

In view of this differing version between the refinery authorities on the one hand and the Monghyr Municipality and the Bihar Government on the other, the Commission has carefully examined the temperature data supplied to it by the refinery authorities (BRD-19). The Commission finds that these datas were collected near the Mokamah Bridge (Rajender Bridge) and were compiled from the records of the Ganga Discharge Circle, Ministry of Irrigation & Power. A careful study of the temperature data shows that the average of both the maximum as well as minimum temperatures were progressively falling from October, 1967 till the first week of February, 1968. The night minimum temperatures were falling much faster which meant that the cooling down of the atmosphere was proceeding much faster in the night than in the day. In October, 1967, the maximum day temperatures varied generally between 30° and 40°C but were mostly between 35° and 40°C. The night temperatures in October, 1967 were generally between 23° to 25°C upto 19th October and were between 19° and 21°C between 20th and 30th October, 1967.

On October 4, 5 and 6, 1967, the temperatures were 33°, 30° and 28°C. It is significant to note that there was rain on 4th and 5th October. It is pertinent to mention that the temperatures which are normally recorded in the shade are not only dependent on whether the measurement is taken at day or night but also on the wind condition. If a warm wind blows for any reason the temperature rises suddenly. Similarly if there is rain or if there is cold wind blowing, the temperature suddenly drops but this may be only for a short while and this would not necessarily lead to freezing or melting of liquids. In November, 1967, although there was only a few days on which the maximum temperature reached 40°C and even went up once to 43°C, there were more days than in October when the day time maximum temperature was around 30°, 31°C; but the more significant drop was in the minimum temperatures of the night. After about 10th November, 1967, the minimum temperatures were generally between 12° and 13°C whereas between first and 9th November, 1967 they were between 19° and 22°C. Likewise, there was a progressive drop in average maximum temperature in December but a more significant drop in the night temperature which went down to 10° to 13°C. The Commission has particularly noted the fact that between 16th and 31st January, 1968 the minimum temperature was generally between 7° and 8°C except on three nights. Similarly from 1st to 19th February, 1968, except for four nights the minimum temperature was generally between 6° and 9°C. Thus from 10th January to 19th February, 1968, over a period of 35 days except on seven days the average minimum night temperature was between 6° and 9°C. In February for a continuous stretch of ten days from 10th to 19th, the temperature never rose above 9.5°C. On the 20th February, the day maximum temperature suddenly increased to 35°C which it had never reached during any other earlier day in February. Similarly the night minimum temperature increased suddenly to 13°C. The relatively higher temperatures were being maintained during day and night from 20th February till the day of the incident.

At this stage it is important to note that freezing of a large volume of liquid cannot take place simply because the temperature drops suddenly for a short period. For example, a bottle of coconut oil cannot freeze after the bottle is dipped in a bucket of ice cold water for a short while. The freezing of liquid takes place when it is kept under suitable cold conditions for a reasonably long period until the latent heat contained in the liquid is removed. It is, therefore, quite clear that during January and February, 1968, particularly after about the 15th January till about the 19th February, 1968, there was sufficiently long continuous period of cold nights when the oily material in the effluent channel could easily have solidified. Similarly it requires an adequately long period of warm conditions before a frozen material can melt and become liquid again. The temperature data shows that such warm conditions did prevail in the day time from about 26th February onwards when the maximum day temperatures

were about 34°C and the day temperature on the 2nd March was 42°C which was very high. It is important to note that after the 25th December, 1967 until 2nd March, 1968, the day time maximum temperature crossed 40°C only once and was generally below 30°C except in the last half of February.

It is also important to note that for a liquid to freeze or melt not only the atmospheric temperature but also the wind conditions and the surface on which the liquid is held are important. There is no data on the actual wind conditions other than what one can make a reasonable guess by noting the temperature variation. It is, however, a well-known fact that the temperature water surface and sandy bed surface would be much cooler in the night time than what is indicated by the temperature measured in the shade. Similarly in the day time the sandy surface is always hotter and the water surface much cooler than the maximum temperatures indicated in the shade. The Commission wishes to point out that although the maximum day temperature in the shade could be as high as 28° or 29°C the water temperature at the same day time would be much lower. Therefore, the oily material that must have been floating on the effluent in the channel must have remained in a solid or semi-solid condition and would not have moved as a liquid, even if the top surface might have become softer due to sun's rays or even if some material on the sandy banks might have melted. The Commission further wishes to point out that as shown by the analysis report of the slop oil already quoted earlier, the pour point of slop oil is generally found to be between 30° to 33°C. Such a material, when once frozen due to continuous low temperature, in the nights, would not easily melt merely because the day time maximum temperature reaches 28° or 29°C. The day time maximum temperature must exceed the pour point and remain at least for a few days before a whole mass of frozen material can completely melt. If the day temperature exceeds 30°C only for a short while, as is meant by the maximum temperature, only the top surface might melt but the lower portion still remains solid or semi-solid. It is also important to note at this stage that, as is always the case with weather temperature data, the maximum temperature occurs only for a short period of the day and similarly the minimum temperature occurs for a short period or an instant in the night. During the remaining part of the day and night the temperatures are in between these limits. It is, therefore, quite clear that during January and February, 1968, the range of temperature during day and night was substantially lower than the October, November and December, 1967. This range has again started to increase during the last week of February and first week of March, 1968.

From the foregoing discussion it is apparent that the temperature conditions during January and upto 20th February, 1968, were very conducive to freezing of oily material having high pour points and that the steadily increasing average temperature levels during the last week of February upto 3rd March, 1968, were conducive to melting of the previously frozen material. The Commission, therefore, cannot agree with the contention of the learned counsels for the Monghyr Municipality and the Bihar Government that the freezing and melting theory proposed by the refinery was an after-thought and was an explanation advanced by the refinery to cover up for large discharge of oily material prior to the incident. The Commission would, however, like to point out that the freezing and melting of the oily material does not preclude the discharge of large quantities of oil by the refinery during the last week of February, 1968. In fact, the Commission is of the opinion that if an oil product particularly with a low pour point such as ATF or any other light product was discharged in large quantities during the last week of February and upto 2nd March, 1968, when the day time maximum temperatures were above 32°C and night generally above 12°C, it would greatly help the melting and dissolution of the freezing or frozen material and would quickly float as a liquid down the river. This aspect would be further discussed under technical consideration in a later chapter.

CHAPTER XI

CAUSE OF CONTAMINATION—contd.

DISCUSSION ABOUT DISCHARGE OF ATF WHICH HAS GONE OFF-SPECIFICATION

The Counsels for the Monghyr Municipality and the Bihar Government have pointed out that another important cause of contamination at Monghyr was the discharge of large quantity of ATF (Aviation Turbine Fuel) into the Ganges. Shri Misra urged that during the last week of February 1968, ATF produced at Barauni was found off-specification and a Committee was appointed by the Indian Oil Corporation which was soon to come to make inquiries and the refinery authorities being afraid of the inquiry discharged this ATF in large quantity. It is further pointed out that the fact that strong smell of kerosene oil was found in the filter beds of mechanical filter and storage tank spoken to by large number of people in their affidavits and the letters of the officers of the Bihar Government clearly proves that the refinery drained out ATF during that period. These facts are denied by the Barauni Refinery, who explained that ATF going off-specification was quite common; that when this happens, the product is downgraded as superior kerosene and sold as a normal product; that there was no need at all for the refinery to discharge the downgraded ATF into the river, and that even if they drained out some ATF during cleaning of the tanks, the material would not go directly into the Ganges but would have to pass through Sector 6 where the oily material would be separated out.

In support of these contentions of the refinery there is the evidence of Shri Tuli, CW 3, Shri Puri, CW 11 and Shri Hyder, CW 4. On a question put to CW 3 at p. 345, he said: "I meant this quantity of ATF is renamed as superior kerosene." On a further question he answered: "when it (meaning thereby ATF) fails in one particular specification and because it is of dual purpose it is normally termed as superior kerosene." He further stated: "this ATF was of below quality for not meeting one particular specification of ATF."

On a question in cross-examination put to Sri Tuli by Sri Misra at p. 347:

> "May I put it to you that all ATF was drained out to the Ganges between 19-2-68 and 24-2-68?"
>
> *Ans.* It is not only incorrect, but it is preposterous. It is an accusation against the Excise Department.

On another question:

> Shall I put to you that all that was contained in tank 95 was drained out and workers were engaged over-time to clean it after draining it out on the night of 24-2-68?
>
> *Ans.* It is completely wrong—p. 350.

Shri Puri at p. 1050-ER stated: "On 18th evening a message was received from the Marketing Division that the ATF from tank 95 has failed on silver corrosion; so it was decided to downgrade the ATF in the tank 95 to SK which is also evident from the R.G. 1, Register of ATF (OD-5, p. 37, col. 6 for the month of February) as well as R.G. 1, Register of superior kerosene (OD-8, p. 42, col. 6).

Sri Hyder, p. 456:

> Dr. Krishna: This emulsion was ATF, SK or some other oil?
>
> *Ans.* This tank is meant for ATF.
>
> Dr. Krishna: Could it be downgraded to SK?
>
> *Ans.* Yes, Sir.
>
> (p. 485)
>
> Dr. Krishna: What happened if the product, or if the specification is not considered good for the laboratory? What do you do with the product?
>
> *Ans.* It depends on the product. Suppose the tank is certified; we then hand over the tank for despatch. If it is not certified, some specification is not what it should be, we then downgrade it as SK, if laboratory certifies it as SK.

On another question by Dr. Krishna:

> Suppose it is handed over to the despatch and within a day for some reason something happens and you suspect it and send the sample for test. You find it not satisfactory. Then what do you do?"
>
> *Ans.* (p. 486) If it is good as SK it is sold. In the case of ATF we do that, we designate it as SK finished product tank.

Shri Misra for the Monghyr Municipality has argued that the explanations given by Shri

Tuli (ER pp. 340—350 and pp. 378—385) and Shri Puri (ER. pp. 1050—1055) and the account they have given of the ATF stock on 18-2-68, its subsequent downgrading to superior kerosene and the disposal of these stocks during the period 19-2-68 to 25-2-68 were not convincing and that at least 300 kl. of ATF was discharged into the river Ganga.

The Commission has carefully gone through the evidence of Shri Tuli and Shri Puri, the Excise Register record OD-5 for ATF, OD-8 for SK and OD-6 for monthly returns for exciseable goods, the Shift Foreman's instruction book of OM&SR (BRD-45) and the daily tank dip reports (BRD-56).

Shri Misra's contention that the ATF stock in tanks 95 and 96 between the period 18-3-68 and 25-2-68 were not properly accounted for appears to be based on the following observations:

1. Excise Register OD-5 shows (p. 37) that the entry for quantity cleared from refinery on 18-2-68 was struck off and corrected. Similarly the figures for opening balance and total stock on 19-2-68 were struck off and corrected.

A careful examination of the entries for 18-2-68 shows that the figures for opening balance, total stock and closing balance were not struck off and only the entries for the quantity cleared from the refinery and the loss were corrected. This clearly shows an error in the entry for quantity cleared which has been corrected by adjusting the loss. In case of entries for 19-2-68 the first entry under opening balance on the line against this date was 1061.639 which was then struck off and the figure 182.727 was written. This was further struck off and the figure 1061.639 was again written. Under total stock the first entry on the line was 182.727 which was struck off and the figure 1061.639 was written.

Shri Misra contended that the corrections in the stock figures on p. 37 of the Excise Register OD-5 showed that the figures were being manipulated to conceal the true facts about the disposal of the ATF which has gone off-specification. In this connection, he drew the attention of the Commission to the two different inks that were used in making the entries and correcting the figures. The Commission carefully examined the entries made on p. 37 of OD-5, using a magnifying glass and could clearly see that all original entries from 18th to 22nd Feb. 1968 appear to have been written in one ink having a bluish tinge. The remaining entries of this page from 23rd to 26th February 1968 appear to have been made using a darker ink with a slight greenish tinge. All the cuttings and corrections on 18th and 19th February and the entry 878.912 under "transfer out" column 6, appear to have been written using the darker ink. The Commission is convinced that the first notings on 19th February were made in the normal course and the corrections were incorporated either on the 23rd or 24th February 1968. This is further proved by the fact that the entries were noted and checked by two officers on the 24th February 1968. If what is contended by Shri Misra that this is a deliberate tampering of figures is taken at its face value, it cannot in any way be a cause of contamination which occurred on the night of 2nd March 1968 at Monghyr, for the simple reason that even if some quantity of ATF which has gone off specification, has been discharged on the 19th it could not possibly have taken so long to reach Monghyr and remained on the river surface. The Commission is clearly of the view that the correction of the ATF stock figures on the 18th and 19th February 1968 in the Excise Register OD-5 was not a deliberate attempt to tamper with figures but was either due to confusion in the method of entry or to genuine correction than any malpractice and it was in no way connected with the contamination at Monghyr.

2. Shri Misra next doubted the method of disposal of the stock in tanks 95 and 96 which were normally reserved for ATF during the period 18-2-68 to 25-2-68 and urged that when he explicitly asked Shri Tuli, CW 3, (ER, pp. 340—350 and pp. 382—384) and Shri Puri. CW 11 (ER, pp. 1050—1054) on the method of disposal of the stocks and to explain the operations, both of them failed to give satisfactory answers. The Commission is not prepared to agree with the contention of the learned counsel.

The Commission finds that the clue to the understanding of the disposal of stock in ATF tanks 95 and 96 lies in a careful study of the daily tank dip reports (BRD 56 for the period 18-2-68 to 25-2-68) and the detailed operating instructions recorded by the Shift Foreman (BRD 45 on pp. 183—197). On 18-2-68 at 7.00 a.m. the ATF tank 95 had a dip of 254 cms. and tank 96 had 46 cms. dip. After despatching 151.5 kl. on the 18th February 1968, the refinery came to know that the ATF was off-specification on one property. So the whole of the remaining quantity in tank 95 was downgraded to superior kerosene (SK). The total dip of 300 cms. is equal to about 1217 kl. The tank 96 with 46 cms. dip had not been touched in the operations until the 21st February 1968. The dip in tank 95 at 7.00 a.m. on 19-2-68 was 216 cms. which is equal to about 880 kl. (the exact figure depends upon the calibration of the tank). Thus the whole quantity of the downgraded ATF in tank 95 after the initial despatch on the 18th February 1968 was about 880 kl. and is accounted for by the 7.00 a.m. dip of 19th February 1968 and the entry under "transfer out" in the register OD-5. On 19th

February 1968 104 cms. of downgraded ATF has been despatched as SK. The dip on 20th February 1968 at 7.00 a.m. was 112 cms. On the 20th some more material was despatched from this tank, dropping the dip to about 64 cms. The total despatches on 19th and 20th February, 1968, from tank No. 95 were made into TTK tank 125. At this stage it may be noted that the balance stock of 182.727 kl. of ATF noted in the register OD-5 on 19th February 1968 and on all the subsequent days upto 27th February 1968 refers only to the material in tank 96 which was having a dip of 46 cms. The total contents of tank 95 have already been downgraded as SK. Only the contents of tank 96 were still being called and accounted as ATF.

On the 20th a part of the SK from tank 95 was pumped to 94 dropping the dip from 63.8 cms. to 34.5 cms. From 21st to 24th February evening the entire operations on tanks 95 and 96 were only to recover the remaining quantities of ATF or SK and to clean the tanks thoroughly so as to prepare them ready to receive the fresh batch of ATF being produced in the refinery. Detailed notings to this effect are found in BRD 45 (pp. 185—196). Shri Y. D. Puri has explained these operations very clearly in his replies to questions from the learned counsel for the Barauni Refinery (ER-pp. 1050—1055). Thus in these transfer and cleaning operations on tanks 95 and 96 which contained 46 cms. of ATF at 7.00 a.m. on 21st February 1968 was filled with some water to raise the oil level and to clean the tank bottom. On the 22nd some water was at first drained and all oil in tank 96 together with some water was transferred to tank 97. Again some more water was admitted. At this stage tank 96 had only water with 80 cms. dip. From tank 96 some water was transferred to tank 95 with a view to clean the bottom of tank 95 and to raise the oil level. Then on 22nd itself the oil in tank 95 together with perhaps some water was completely transferred to tank 97.

It is thus clear that on the 22nd both the tanks 96 and 97 were subjected to series of cleaning operations and the oil present in both the tanks was transferred to tank 97. On the 23rd February 1968 at 7.00 a.m. both the tanks 95 and 96 were having mostly water as spoken to by Shri Puri referring to the noting in the daily dip tank report (BRD 56). At this stage it must be pointed out that if the ATF in tank 96 (equal to a dip of 46 cms.) was transferred to tank 97 during the day time of 22-2-68 and if very little oil remained in tank 96, the stocks of ATF shown for the period 21st to 27th February 1968 in the Excise Register (OD-5, p. 37) were obviously incorrect because this quantity was no longer ATF and it had been transferred to the kerosene tank 97. The refinery authorities and the Excise officials ought to have checked this while making the entries in the Excise Register. We are sorry to note that no satisfactory explanation in this regard has been given by the refinery authorities.

Another point to be noted is that after this cleaning and transferring operations of tanks 95 and 96, according to BRD 56, only water was remaining in them and all oil has been removed to tanks 94 and 97, whereas the Shift Foreman's noting at 6.30 p.m. on 22nd (BRD 45, p. 188) states: "(a) fill up TK 96 with water (after making Hose connection from hydrant to gauge hatch of TK 96), daily total dip (oil + water) of TK 96 is 80 cms." Similarly the noting on 23-2-68 at 12.30 hours (BRD 45, p. 190) states: "TK 96 is having some 2 cms. of which will not be drained." These notings clearly show that although the remaining quantity of oil in tank 96 was small it was having at least 2 cms. dip. On a question being put by one of us (Dr. Krishna) to Shri Puri, he, at p. 1054-ER stated that the 2 cms. referred to an emulsion, there is always some emulsion during transfer of oil when there is water. He however admitted that the letter 'E' which is normally written to indicate the presence of emulsion is not written in this case and the word oil is clearly written by the Foreman.

During the rest of the day on the 23rd, after settling, some water was drained from tanks 95 and 96 and the dips on the 24th morning at 7.00 a.m. were 31 cms. in tank 95 and 33.5 cms. in tank 96. At this stage the cleaning by flushing with water was apparently completed and the tank 95 in which the ATF went of-specification earlier, was handed over to the maintenance department for thorough cleaning. Tank 96 in which the earlier stock of ATF *did not go off-specification* was cleaned and made ready to receive a fresh stock of ATF from the production unit, merely by flushing with water and draining it out during 22nd to 24th night. Shift Foreman's instruction book (BRD 45, p. 195) shows that on the 25th all the ATF produced upto 4.00 a.m. was transferred to tank 96. The daily tank dip report at 7.00 a.m. on 25-2-68 shows a dip of 199 cms. in tank 96; this was ATF.

It is thus clear that during the period 21st to 25th February 1968 tanks 95 and 96 were flushed and cleaned and the oil was transferred from these tanks to tanks 94 and 97 and there is no reason to doubt these operations. What is urged by Shri Misra is that since a two-member committee was appointed by the Indian Oil Corporation to go into the question of off-specification and that Committee was expected to come and make an on-the-spot enquiry at Barauni, the refinery authorities being afraid of this, dumped either the entire ATF or a substantial quantity of it into the river.

The Commission cannot accept this argument for the simple reason that if ATF is off-specification on silver corrosion test, it would still be good SK and no refinery would ever try to dump such a costly material into the river for fear of inspection by a Committee. The Commission further wishes to point out that at the instance of Shri Misra, it had sent for the confidential report of Harbans Singh Committee. After going through the report, the Commission found that it had nothing to do with the Monghyr incident. It dealt with the quality control aspect of the product in the refinery. This was made clear a that sitting at Barauni.

Shri Misra drew our attention to another fact that if that was so, where was the necessity to engage three Operators on the night of 24-2-68 to empty out tank 95 except to drain out the off-specification ATF. It is true that on a scrutiny of the O.T. slips (BRD 35, 36 and 37) three operators were engaged from 10 p.m. on 24-2-68 to 6 a.m. on 25-2-68, "to empty the TK 95 as per the orders of DME". But the OT slips show that the work was organised by the Mechanical Maintenance Department and not by the OM&SR division which is responsible for the movement and storage of oil products within the refinery and which was dealing with the ATF stocks. From the operating instructions noted in the log book (BRD 45, pp. 183—195) and from the tank dip reports (BRD 56) for 18—25th February 1968, it is quite clear that all the down-graded ATF has been transferred from tank 95, either to the TTL tank 125 or to tanks 94 and 97 and that by the morning of 24-2-68 there was only water (dip 31 cms.) in tank 95. It was likely that it contained small quantities of oil whose dip measurement was beyond the limits of accuracy. It was in this condition that tank 95 was handed over to the Maintenance Department. The following noting was made in BRD 45 (pp. 192-193 at 12.30 p.m. on 24-2-68): "TK 95, ATF TK, is to be H/O to *Mce* immediately with whatever dip it is having. Send one work order to Mce Department to the effect that TK 95 is handed over to Mce in the light of Production Engineers' talk with CME..." These facts show that there is no basis to believe that during the overtime work on tank 95 in the night of 24-2-68 any substantial quantity of ATF could have been drained out from this tank. If any ATF was at all discharged during this work it must have been so small that it could not be accurately measured by dips. Even assuming that some quantity was present and was discharged it could only have gone to sector 6 and would have had to pass through the guard basin before reaching the river. It would no doubt aggravate the problem if sector 6 is already over-loaded at that time. The question of over-loading will be considered subsequently.

It cannot, however, be ruled out that oil from tank 96 of about 2 cms. dip was drained out, wholly or partly, following the instructions from Plant Manager, Sri Puri, as noted in the Shift Foreman's instruction book at 7.15 p.m. on 24-2-68 (BRD 45, p. 195): "V. V. Imp. Instruction by Shri Puri, P/M for TK 96: (i) Drain water from TK 96 keeping the drain valve fully open upto 9.30 p.m., if some oil is also going, let it go."

2.0 cms. dip in this tank would be equal to about 8000 litre. It is probable that in their anxiety to get tank 96 ready in a good condition to receive ATF during the night of 24-2-68 the refinery authorities might have considered it expedient to drain out the water quickly even if it meant that adequate time was not being given for the oil and water to separate properly. Since tank 96 was already in a reasonably good condition, as shown by the fact that ATF in this tank did not go off-specification, there was no need to drain out the entire quantity of oil for purposes of cleaning the tank. Therefore, it is reasonable to conclude that even from tank 96 all the oil with a dip of 2 cms. might not have been drained out because there was no reason to do so. The instruction quoted above clearly indicates that, if in the draining operation, some oil is also passing with water it should be allowed to go. It is, therefore, not reasonable to interpret this instruction to mean that all the oil was drained out. It may, therefore, be concluded that some oil from tank 96 might have been drained out with water sometime between 7.30 and 10.30 p.m. on 24-2-68. It is difficult to estimate the exact quantity of oil drained out but the maximum would be about 8000 litres. Even this quantity must have gone to Sector 6 oil separators and if the separation here is not sufficient or if there is no space for skimming it would have gone with other oily matter in the effluent into the Guard Basin. The oil discharge from tank 96 cannot in any way go directly into the effluent pumping station or the river Ganges.

All this above would go to show that the cleaning operations in tanks 95 and 96 during 22nd to 24th February, 1968, as recorded in the Shift Foreman's Instruction Book (BRD 45), when read in sequence, were intended to get the tanks ready so as to avoid contamination of the freshly made ATF which was going to be received in tank 96 and which was to be despatched on 26/27th February 1968.

(iii) Next question to be considered as contended by Shri Misra is the smell of kerosene oil found at the river and Water Works at Monghyr. What is urged by Shri Misra is that the very fact that so many witnesses deposed to having noticed strong smell of kerosene oil is sufficient proof that ATF was discharged. We

have already discussed the documentary and oral evidence relating to the smell of 'kerosene like' oil or kerosene oil in the earlier chapter. In this connection, he drew our attention to the evidence of CW 1 wherein he has said that he felt strong smell of kerosene at the effluent pumping station on the night of 23rd. The dip reports and operating instructions however show that on the 23rd night only water was being drained out from ATF tanks 95 and 96 and no major discharge of oil was being made. It was only on the 24th night that overtime workers were engaged to empty out and clean tank 95 and drain out water from tank 96. The evidence of CW 1, therefore, is not adequate proof of discharge of ATF on 23rd night.

It must be emphasised at this stage that the smell of petroleum products can be very deceptive, particularly mixtures of commonly known products. An ordinary person knows the names and the smells of only the common products like 'petrol' (gasoline), kerosene and to some extent diesel oil. They do not seem to know the smells of many other products, for example, coker gas oil, coker kerosene, fuel oil, etc. which are all being produced at the refinery. These products, particularly from the coker, give strong and pungent smell and presence of coker products in some proportions in a mixture can give a misleading idea of the smell of kerosene. The oil passing out of the Guard Basin with the effluent and reaching the effluent pumping station is a mixture of different products whose proportion is never fixed and would depend on the operating conditions of different units. An ordinary person would normally identify a smell with that of a product known to him and having the nearest smell. It is pertinent to note here for this very purpose one of us (Dr. Krishna) demonstrated by putting slop oil and other products in four glass beakers and asked the persons present before the Commission including the lawyers one by one to smell the beakers and tell the Members of the Commission what was the smell they noticed. We may point out that none of them could correctly indicate what was the smell except that in some beakers the smell was similar to kerosene, although some of the products were different. It is, therefore, incorrect to attempt to identify a smell emanating from a mixture of products with that of a particular product in a quantitative way. On the other hand, it can safely be stated that the smell is indicative of the probable presence of a particular paoduct; nobody can state the quantity.

Regarding the smell noticed by many persons at Monghyr, it can only be concluded that the smell could be indicative of the presence of kerosene like product. ATF, being a more refined kerosene range product, could have been present. On the other hand, much of it, if present at the point of effluent discharge into the river bed channel, would have vapourised due to wind and solar heat, during its travel over a distance of 40 miles to Monghyr. The quantity that remained would depend on its proportion in the mixture and nature of other products. The main reason for the strong and pungent smell at Monghyr must have been the large surface over which oil was spread on the river. It is well-known that oil spilled on a floor gives more smell than that from the same quantity held in an open container. Large surface of spread means greater rate of vapourisation, hence greater smell of those components of the mixture which vapourise faster. For example, if large quantities of gasoline are present in the mixture containing kerosene as well, the smell could be expected to be mostly that of gasoline.

Thus the only conclusion that can be drawn from the statements on smell at Monghyr is that products smelling like kerosene were present in the oil found at Monghyr and these could have been straight run, inferior or superior kerosene, or any coker products including fuel oil or ATF. There is no reason to believe that it could mostly have been ATF. A part of the ATF which was discharged during draining and cleaning of tanks 95 and 96 and which may have escaped from the guard basins might have reached Monghyr after some losses due to evaporation.

CHAPTER XII

CAUSE OF CONTAMINATION—contd

DESCRIPTION OF PLANT FOR TREATMENT AND DISPOSAL OF EFFLUENT AND NOTES OF INSPECTION OF THE REFINERY

The Commission has now to consider whether what all has been established in the previous chapters on the basis of documentary and oral evidence gets support from a technical scrutiny of the data submitted and of the functioning of the equipments in the refinery.

But before doing this the Commission would like to put on record what all was shown during the inspection of the working of various units of the refinery and the explanations given by the operators and responsible officers. During inspection the operators and other officers in charge of various units of the refinery explained to the members of the Commission the detailed lay-out of the complete effluent and waste disposal system of the Barauni refinery as designed and as finally functioning before and after the incident. The following account is based on the explanation given by the officers of the refinery and the description of the units given by the refinery in its memorandum in reply to the questions issued by the Commission (Memorandum of the refinery, Paras. 26—54).

The lay-out of the effluent and sewage disposal system is divided into two heads, *viz*:

A. effluent and waste disposal system within the refinery boundary—for reference see Drawing No. EF/648/01/IV/01 and EF/648/01/IV/03, Appendix VIII(iii); and

B. effluent and sewage treatment system outside the refinery boundary—see PH/14a; PH/W/31 and PH/W/39—Appendix VIII(iii).

A. Effluent and Waste disposal within the refinery

Industrial and storm water drainage system is further divided into two main heads, i.e. industrial drainage and storm water sewage. The industrial sewers are sub-divided into four groups, depending on the nature of their contamination:

1. drains carrying water containing oil products;
2. drains carrying water containing acid, alkali and oil;
3. drains carrying T.E.L.; and
4. drains containing coke fines—for reference see Drawing No. IV/01 "R" series.

Storm water sewage—for reference see diagram No. IV/01 and EF/648/01 Part I "R" series.

It was pointed out to the members of the commission during inspection that the storm waters or the rain waters which fall within the dykes of the crude tankages and finished product tankages brought to sector VI through special drains known as storm water sewage and this is not connected to the normal oil delivery system and goes to the emergency basin No. II and Guard Basin No. II before it is sent out of the refinery. At both the above facilities pipes have been provided to skim the oil that may be carried along with the storm and rain water to sector VI. The oil thus removed is pumped into slop tanks. The rain and storm water falling within the intermediate tank dykes and the process unit is brought to the oil recovery sector through the industrial oil drains.

The storm water from all other areas of the refinery is removed through open drains along the roads and goes outside the refinery area without going through the normal oil recovery system.

Fecal sewage Drg. No. IV-03:—Fecal sewage drains are laid separately from the toilets of the industrial and service buildings, power-plant, canteen, first aid room and is brought to a central pumping station before it is pumped through the sewage treatment plant outside the refinery.

Industrial sewage disposal system:—The industrial drainage water containing oil products comes to the oil recovery sector VI through industrial storm water drain from all process units, crude tanks, finished product tanks and storage tanks. The oil recovery sector VI comprises the following:

1. Storm water discharge weir;
2. Sand trap;
3. Oil separators;
4. Industrial and Storm Water Pump House;
5. Guard Basin No. I;
6. Emergency Basin No. I;
7. Silt Accumulators;
8. Skimmed oil pumping station;
9. Skimmed oil settlers;
10. Skimmed oil pumping station for pumping oil to the slop tanks in sector VI;
11. Emergency Basin No. II;
12. Guard Basin No. II.

For reference see diagram No. EF/648/01 ...Appendix VIII(iii).

The refinery engineers, particularly Shri Verma and Shri Hajela, explained in detail the working of each unit and pointed out that water contaminated with oil from the various units flows through storm water discharge weir and during normal operation all the drainage water containing oil goes to the oil separators through the sand trap. In the event of excessive flow or an emergency in the intermediate tanks the oil and water over-flow the weir and go to emergency basin No. I from where the oil is skimmed to the skimmed oil pit before it is further pumped to the slop tanks. The water from the oil separators containing 100—150 PPM of oil automatically flows down to the industrial and storm water pump house pit from where it is pumped to the guard basin and is allowed to settle for about two days before it leaves the refinery boundary containing 30—50 ppm of oil.

With the above background we would now like to refer to the working of each unit of sector VI.

Storm water discharge weir is the first unit where the industrial water with oil enters the oil recovery sector VI. Here the Commission was told that the construction of weir was such that in the event of excessive flow, the oil and water over-flow the weir and flow down to emergency basin No. I. The sluice gate valve towards the E. Basin No. 1 is kept partly open to take excess drainage water and oil.

The second unit is the sand trap which has two sections. At the inlet part of the trap a gate is provided to prevent passage of big pieces of wax and impurities coming along with the industrial sewage. The sand and mud coming with the water settles here and is cleared periodically by means of a hydroelevator and sent to the silt accumulators.

The third and important unit of the sector is oil separators (diagram No. EF/648/01). This is the main oil skimming arrangement. It has a total capacity of about 1200 M^3 which is equal to about two hours discharge of the industrial drainage. The floating oily products come to the surface of the water from where it is skimmed through the skimming pipe and taken to the skimmed oil pump house pit. The floating oily product is brought to the slotted oil skimming pipe by the slowly moving flight cleaners. The flight cleaners collect the oil products from the surface to the oil collecting pipe and also sludge from the bottom to the pit of the bottom valves of oil separators. The sludge from the bottom pit is taken to the silt accumulators by means of hydroelevators.

Another important unit of sector VI is industrial and storm water pump house—diagram No. DOF/646/01. The discharge from oil separators along with discharge from acid and alkali line and coke slurry lines go directly into this pump pit from where pumps pump out the same to guard basin No. 1 which is the last point in the refinery territory.

The other important unit is guard basin No. 1. This is intended for lengthy settling in it of all sorts of industrial drainage which come after preliminary treatment in the oil separators. It consists of three sections each of which is equipped with a water distributing gutter, over-flowing atmosphere syphon pipes and four swing pipes in each section for collecting oil at the inlet and outlet of the basin.

Next is the emergency basin No. 1. This is intended for holding the oil products entering the industrial sewage system in case of emergency at the refinery for temporary accumulation of storm water. This is connected with two swing pipes, one in each basin, for collecting oil products and also sluice gates at the inlet and outlet of the industrial and storm water pump house. The oil that is accumulated in the emergency basin No. 1 is skimmed by lowering swing pipe and is taken into the pit of the skimmed oil pumping station which is further pumped on to the skimmed oil settlers on way to the slop tanks to be used along with crude.

Next unit is silt accumulators. It accumulates silt or sludge coming into the industrial and storm water system. The settled water is drained off through the water diverting manhole namely sluice gate which further discharges into the industrial and storm water system.

The skimmed oil pumping station is designed to receive (1) 30 M^3 of oil per day from the first system recirculating water; (2) 130 M^3 from the third system; and (3) 34 M^3 of oil coming in the industrial sewage from the oil separators. The oil against items 1 and 2, that is, about 168 M^3 of oil directly comes into the pump pit through the skimmer pipe of the recirculating water system in sector VII and this oil is not routed through the oil recovery system in sector VI.

Another unit comprises the skimmed oil settlers which are four tanks of 400 M^3 capacity each. The treating time allowed in the settlers is about three days to separate oil from water. The water is drained and taken back into the industrial sewage system and the oil is taken through to the skimmed oil pumping station to sector V.

For the disposal of the storm water from crude and finished product tankage two facilities are provided in sector VI, namely: (1) emergency basin No. 2; and (ii) guard basin No. 2.

Storm water within the dykes of the finished and crude tankages directly comes into the emergency basin No. 2 which has a capacity of 5,000 M^3, for reception of oil products in case of emergency in anyone of the crude or finished product tankages each having a capacity of 5,000 M^3. This basin has two swing pipes for collecting oil products. There are two gate valves provided on the outlet pipes of the emergency basin No. 2. In cases of emergency or burst of some tank in the tankage area, the oil is led into emergency basin No. 2.

Guard Basin No. 2 is designed for settling and partially for accumulation of storm water entering from the crude and finished product tankages.

During the time of the inspection it was brought to the notice of the members of the Commission that the performance of oil separators has been generally satisfactory and one section of the three was utilised for storing skimmed oil. It is completely segregated and there was no possibility of oil finding its way into the effluent system. Operation of guard basin No. 1, emergency basin No. 1, silt accumulators and skimmed oil pumping station were also said to be normal and satisfactory.

Emergency basin 2 and guard basin 2, it was stated, were never used as there was no occasion. The E.B. 2 is connected directly on one side to the tank area, without any intermediate oil separation system and on the other side to the G.B. 2. The discharge side of the Guard Basin No. 2 is connected directly to the effluent manifold. In order to check the possibility of any oil having gone from G.B. No. 2 directly into the manifold, these units were specially inspected. The Commission found that the bed and sides of Guard Basin No. 2 were covered with grass and did not show any indication to show that the unit was ever filled with much oil. There were some dark marks on the sloping embankments on the entry side but these marks were at a low level. The Commission, therefore, believes that no oil has escaped from Guard Basin No. 2 to the manifold.

While going round the refinery, at the request of the commission, several effluent water samples were collected from the drain pipes; oily effluent samples were also collected from the coke settlers, oil separators, guard basin No. 2 effluent and other places. Samples of the regular products manufactured by the refinery were also collected.

The Commission found that the mechanism in coke settlers was not functioning and the members were informed that this was being modified due to its unsatisfactory performance. The flight cleaners in several sections of the oil separators in sectors 6 and 7 also appeared to need repairs. In sector 7, the Commission particularly saw the condition of the water and found that a stable emulsion was floating. The emulsion had a regular pattern and indicated the possibility of biological growth. The wooden planks (flight cleaners) also appeared to be deteriorating.

B. Effluent and sewage disposal system outside the refinery

The effluent and sewage treatment system outside the refinery will now be briefly described. These facilities consist of:

(1) the effluent pumping station (Drg. No. PH/D/14A)

(2) the sewage treatment plant (Drg. No. PH/W/39)

(3) effluent pumping main for disposal of refinery-effluent and sewage from township and refinery (Drg. No. PH/W/38).

1. *Effluent pumping station*: (*Drg. No. PH/D/14A*): This station essentially consists of 10 open type 3000 G.P.M. to pump the effluent to the outfall through a 48″ dia. pipe-line.

The Commission inspected the effluent pumping station on Saturday the 10th August, 1968, and again on Monday the 21st October, 1968. Automatic switches have been installed to operate a particular pump when the level of sewage in the sump reached a particular height. The Commission was informed that they were not operating.

During inspection of the annular sump around the pump house pit, the commission noticed that the inner wall surface of the sump was fully covered upto the top with a dark deposit, which started to slowly melt when there was direct sun light on it. The commission collected a sample of this deposit for examination.

2. *Fecal sewage treatment plant*: The fecal sewage treatment plant is located on the south-eastern corner of the Railway boundary. It treats the fecal sewage pumped from (i) Township and (ii) Refinery (Drg. No. PH/W/39).

The sewage from Township is conveyed through a 15″ dia. C.I. pumping main to the treatment plant. Refinery sewage flows to the same place through a 6″ dia. main to a common chamber. (Drg. No. PH/W/38).

An activated sludge plant on the diffused air system is adopted for the fecal sewage treatment. (Drg. No. PH/W/39). The primary treatment consists of screening, grit removal, followed by sedimentation.

Secondary treatment consists of aeration followed by final settlement. A part of secondary

sludge so obtained is sent back to aeration tank for reactivation while the remaining sludge goes to sludge digestion tanks along with the sludge from primary sedimentation basins. The digested sludge is dried on drying beds. The liquor flows to effluent pumping station. The dried sludge will be disposed of in a suitable manner.

When the Commission inspected this plant on 10th August the members were informed that the plant has not been constructed to accord with the description as given above and that instead of constructing the digestors to digest the sludge separately, sludge digestion has now been incorporated in the design of the primary sedimentation tank or the claridigestor as it is specified in the design of M/s Dorro Liver (India) Ltd. (whose design has been adopted by the Refinery). The construction of the plant in lay-out as well as in the units varies considerably from what was proposed as per the original design. (Drg. No. PH/W/9 of 10-2-62, App. V to BRD-39).

The Commission found that even though 4 years passed, the plant was not operating even on their second visit in October, 1968. The whole site was smelling of strong odour of hydrogen sulphide and the members found that sceptic raw sewage was being pumped continuously to the effluent pumping station during all these years (1964—68) in contravention of the stipulation under which the Bihar Government permitted the refinery to discharge its combined effluent of refinery waste and storm water with fecal sewage into the Ganges (vide BGD 14).

Although there was provision in the original approved scheme for construction of office laboratory and stores, this laboratory has not been constructed.

3. *Effluent pumping Main (Drg. No. PH/W/38)*: This comprises 8379 metres of 48" dia. steel pipe as per details shown in Drawing No. PH/W/38. The last 600 ft. which was originally intended to be constructed by an open channel has been replaced by R.C.C. and steel pipe of the same diameter. The extension of the line upto the point of outfall can be seen in the above drawing.

According to the original scheme, it was proposed to place on the sewage pumping main 2 non-return valves, 4, air valves, 3 relief valves, and 1 flood flap valve. Against this the members have been informed that 2 non-return valves, 11 double air valves, 3 relief valves and 1 flood flap valve have now been provided.

Most of the length of this pipeline remains under water and initially these valves were not protected by the construction of chambers around them. The air valves, therefore, did not function as muddy water must have entered the valve chambers through the nozzles and seized the balls of the valves in their housings. The members were informed that as the valves were exposed they were tampered with and damaged by miscreants and to protect them, masonry chambers were constructed around each valve which the members saw.

The Commission also noted that a regular road for inspection of the pipeline was not constructed although there was provision for it in the scheme. The members of the Commission could inspect a small length of this road until it ended in a nallah, with Mr. Harnal, DGM(T) in a jeep on Saturday the 10th August, 1968. They tried to walk along the pipeline on Monday the 21st October, 1968, but had to return after having walked for some length as the intervening nallah with pool of water barred their progress. They were taken to the outfall and shown the discharge point ending in a flood flap valve, by the General Manager and the Deputy General Manager (T) by an altogether different jeepable track from the Rajinder Bridge to the outfall point on Friday the 25th October, 1968, and similarly again by the same route on Wednesday the 18th December, 1968. The General Manager and the Deputy General Manager (T) told that it was not possible to motor along the pipeline throughout the 12 months of the year except for a few days. The members were informed that the inspection of the pipeline and the outfall point was done only once before and once after the monsoon, on the orders of the then General Manager.

Although the pipeline was completed long ago, the flow through it cannot be measured as the venturi meter placed on it was still not functioning when the members visited the effluent pumping station on Monday the 21st October, 1968, with M/s Harnal, Verma and Hajela. The quantity of effluent pumped was being calculated from the duration of pumping and the pump capacities,

CHAPTER XIII

CLARIFICATION BY THE MEMBERS OF THE COMMISSION ON CERTAIN POINTS FROM THE GENERAL MANAGER OF THE REFINERY IN THE FORM OF A QUESTIONNAIRE

The questions and answers are noted below:

By explaining, in detail, the lay-out of the refinery and its working the authorities wanted to impress on the members of the Commission with certainty that there was absolutely no possibility of any oil coming out of the refinery beyond the limits prescribed for the effluent oil. The members of the Commission not being convinced by the statements of officers, as admittedly their own officers, Shri Rao, Shri Hajela and Shri Ramamurthi, noticed dark patches of oil along the channel at places and also oil floating near the barges and near Jamalpurghat, wanted to have further explanation from the refinery authorities. One of the members of the Commission (Chairman) put the following questions in the presence of the representatives of the Monghyr Municipality and the Bihar Government and the officers of the refinery.

Q. From all what has been shown to us about the working of the refinery plant you have told us with certainty that in no case there is any likelihood of any oil going out of the precincts of refinery beyond the limits prescribed for the effluent oil. If that is so how do you explain the presence of dark patches of oil along the channel at places and also oil found floating near the barges and near Jamalpurghat as noticed by your officers, Shri T. S. Rao, Shri V. B. Hajela and Shri Ramamurthi?

A. We imagine that something of the kind happened. The effluent out-fall which was supposed to be discharging into the river actually did not reach the flowing waters. What exactly happened was that the river had receded with the result the effluent from the out-fall, discharged on dry sandy bed, made an independent channel of its own along the river and after covering a distance of about ten miles, discharged into two or three shallow expanse of back-waters or lagoons, the last one of which could be anything upto a mile and a half long, and half a mile wide. The dry sandy bed acted as a filter as it were. Whereas water content became liable to progressively diminish and result in insufficient flow in the effluent channel, the oil concentration proportionately increased. The stagnancy of water helped oil to come to the surface. Algae, etc. on the sides mixed up with oil to form spongy scum which either gradually found its way into the huge back-waters or got deposited on the sides. As there was practically no turbulance in the back-waters/lagoons, the oily scum naturally kept floating. On account of low ambient temperature during the winter months, it kept on growing and creating dead pockets on the sides or otherwise remained floating. With the approach of summer towards the end of the February the mass of oily-waxy scum possibly started disintegrating and helped by favourable wind direction gradually found its way into the flowing channel of the river. It is possible that the stuff had been passing out into the flowing channel of the river for sometime in small quantities and went unnoticed. At some point of time it got loose enmasse and found its way to Monghyr after covering a distance of about 50 miles to cause the incident at Kastaharni and Jamalpurghat where there was less turbulance.

The oily scum could not normally catch fire itself or be easily set on fire by striking match sticks. The principle is that there has to be vaporisation of oil and presence of oxygen before any ignition can start up fire. The incident of fire at Monghyr was possibly caused by urchins trying to experiment and see if the oily scum could burn. We imagine that ordinary efforts no doubt must have failed. According to a Press story (which was later confirmed on spot enquiry at Monghyr) the urchins had burnt some twigs and kept them over the oily scum for some time with the result vaporisation took place and there was a fire.

The type of stuff which was found at Monghyr was also located in pockets all along the banks of the effluent channel. Upper reaches of the banks of the effluent channel were found to have pockets of oily concentration resulting from melting of the oily scum with the rise in ambient temperatures. All this goes to reinforce what we imagine had happened.

Q. Can you explain as to from which source this patch of oil could have come?

A. There is no other source. According to our knowledge of the design, we firmly believe that free oil cannot find its way to the effluent main. The design of the refinery is such and there is no evidence from which we can conclude that free oil could escape to the river. It may be that oil contents on occasions may increase more than the permissible limit.

Q. Have you measured effluent mixing the Ganges water and if so what is the velocity at the time of discharge?

A. We have no means to measure the river discharge and we have not done so at any time. The design is based on our effluent water mixing with one-third of the minimum river discharge assumed for the year 1958 as 3600 cu. meter per second.

Q. We understand that recession takes place in rivers; did you notice any such recession and have you maintained any record?

A. No Sir. No such record has been maintained. We were not aware of any recession until the incident.

Q. Did you take samples from the point where your effluent mixes with river water?

A. We have not been taking any such samples before the incident. We have been taking samples after the incident and we have got records.

Q. This morning when we were flying in the helicopter we noticed dark patches of oil floating was mixing with the Ganges water and then the darkness vanished. When we came to the main pumping station and as we looked at it from the top, although there were some patches of floating scum, the water itself had light greenish colour. I presume that the pumping station is pumping out this greenish coloured water. How do you think that this becomes a very dark patch?

A. The out-flow shows blackish colour but when we scoop it in our hands the black hue is not there. When we were making temporary channel on the river bed after the incident this phenomenon was noticed. It can perhaps only be considered as something in the nature of colour illusion.

CHAPTER XIV

CAUSE OF CONTAMINATION

TECHNICAL CONSIDERATIONS

Having discussed the documentary and oral evidence on the facts and causes of contamination, the Commission now proceeds to discuss these matters from a technical view point before coming to a final conclusion.

2. *Composition of the floating oily matter at Monghyr*: In Chapter IX, Section 2, after considering the analytical data on the various samples collected by the Monghyr Municipality, Inspector of Factories and the Refinery authorities, the Commission came to the conclusion that the oily matter floating on the river Ganga at the Kastaharnighat, Monghyr, in the first week of March, 1968, was a petroleum product admixed with other organic matter which contributed to the presence in the ultimate mixture of high percentage of nitrogen and sulphur and that this other organic matter was likely to be undecomposed or partly decomposed fecal matter. It is now necessary to consider whether such admixture of a petroleum product and fecal matter could have been discharged from the Barauni Refinery.

The total organic matter which was floating on the Ganges at the time of the incident was likely to be a mixture of four types of material: (a) petroleum product; (b) fleshy material from the Bata tannery; (c) fecal sewage; and (d) alga and other vegetative matter. These types are discussed below.

(a) Earlier in Chapter IX, while discussing about freezing and melting, it was established that the petroleum product must have originated only from the Barauni Refinery.

(b) *Fleshy matter*: Regarding the non-oily organic matter, as it is well-known that fleshy material contains nitrogen, it was necessary to ascertain whether the Bata tannery was discharging any non-oily organic matter into the river. For this purpose, the Commission inspected the effluent disposal of the tannery and walked on the exposed river bed adjoining the tannery upto the main river stream. The Commission found that the Bata refinery was discharging tannery wastes, after merely settling the solid matter, through a channel in the sandy river bed, which was meeting the river after some distance. Although effort was being made to remove most of the fleshy material depositing in the channel, there was every likelihood of some flesh particles being carried with the effluent which was dirty brown in colour. After a distance of about 500 ft. from the point where the effluent entered the main river streams, the colour disappeared, which showed dispersal of the effluent in the main stream. This disappearance of the colour by dispersal in the river stream was noticed about a mile *upstream* of the Rajendra Bridge. Under these circumstances there was little possibility of any fleshy material from the Bata works meeting the oil effluent from the refinery at the point of confluence of the effluent channel with the river, which was about 12 miles downstream of the bridge and 8 miles down-stream of the refinery effluent discharge point.

(c) *Fecal sewage*: As discussed earlier in Chapter XII, the refinery has admitted that their plant for treatment of fecal sewage has not been functioning properly and in fact was not taken over by the refinery authorities from the suppliers until the date of the incident (T. S. Rao, ER, p.919). The untreated fecal sewage matter was, therefore, getting mixed with the industrial effluent and the mixed effluent was being discharged by the refinery through the effluent pipeline into a pool on the sandy river bed. It is, therefore, clear that all fecal waste from within the refinery and the township has gone into the channel and finally into the Ganga along with industrial effluent containing some quantity of oil.

A further proof of the admixture of untreated fecal sewage with petroleum product was obtained from the analysis of a sample collected by the Commission when its Members inspected the effluent pumping station in August 1968. The Commission found that most of the surface of the inner walls of the circular sump at the EPS was covered with dark brown deposits from the bottom to almost the top of the walls. When there was no direct sun light on these deposits, they were sticking on the walls but when the sun light was on the walls the deposits started to melt due to the heat. Analysis of the sample of the scraping (IIP report sample No. R 0341/19) showed that it contained about 57 per cent oily or waxy matter (by Soxhlet extraction with solvents. The total sample also contained 0.45 per cent by weight of nitrogen and 0.19 per cent by weight of sulphur. Its pour point was 45°C. An important observation was that the sample when kept closed in a bottle during transit from Barauni to the place of the analysis, putrefied and when the bottle was opened obnoxious smell resembling that of hydrogen sulphide was immediately felt. The whole surface of the sample in the bottle

was covered by whitish fungus growth. Such properties could be found in a sample collected from the effluent pumping station only if the deposit was untreated fecal matter. The material extracted with solvents, when analysed after removal of the solvent, had a solidification point of 39°C and a wax content of 15.9 per cent. Sulphur content was 0.38 per cent and nitrogen was 1.08 per cent. by weight. Such high value of nitrogen and sulphur clearly prove that the organic material extracted by the solvent contained substantial proportion of fecal matter. If the effluent coming out of the Guard Basin really contained not more than 50 ppm oil, it was practically impossible for such thick deposits to be formed at such heights on the inner walls of the sump. It is quite obvious that considerable quantities of free oil or emulsions containing oil and wax must have entered the effluent pumping station sump along with untreated fecal matter over considerable periods, enabling accumulation of deposits on the walls.

(d) *Alga and other vegetative matter:* It has been earlier noted in Chapter VII that several officers of the refinery as well as Shri Kumra, CW 7, at p.618, 663, 664-ER, Shri Kurien, CW 5, at p. 526 and Shri Kashyap, Chairman, Indian Oil Corporation, in his report Ex.BRD 21 have seen greenish and brownish alga material floating near the sandy bank of the effluent channel. They also saw algae and grass soaked with oily material at Kastaharnighat, Monghyr. This fact can be taken as established even though Shri Misra in his deposition at p.46-ER on a question put by one of us (Dr. Krishna) has denied that there was any disintegrated vegetative material. There are two possibilities of alga material soaked with petroleum product being found at Monghyr. Firstly, the alga material that has grown on the effluent surface during the stagnancy of the effluent in the channel for a long period would have floated away and accumulated at Monghyr in a short time. Secondly some of the floating mass might have picked up alga matter and grass from the river banks during its travel from the effluent channel to Monghyr. In any case since accumulation at Monghyr was first noticed suddenly on one night, there would not have been adequate time for the alga matter to have grown on the contaminated material at Monghyr itself. Such alga growth usually takes place in stagnant and contaminated waters containing sufficient nutrient material and when exposed to Sun for a reasonable period. Such conditions were prevailing in the effluent channel where the effluent discharged from the refinery must have remained stagnant near the sandy banks for a long time. It is, therefore, clear that the alga and vegetative matter must have mostly originated from the effluent channel itself. It was not possible for the Commission to make an estimate of the quantity of the alga matter carried by the oily material, in the absence of any reliable sample. It was likely that the alga matter which has grown in the effluent channel might have partly decomposed and also partly contributed to the nitrogen content in the sample of the scum collected at Monghyr and whose analysis was discussed in Chapter VII

It can, therefore, be concluded without any hesitation that the oily scum found floating on the Ganga at Monghyr was mostly a mixture of petroleum product and untreated fecal sewage originating from the Barauni refinery and its township. The floating matter might also have contained partially decomposed alga and other organic matter formed in the effluent channel.

3. *Quantity of oily material floating on the river between Monghyr and the Refinery:* Having established that the oily matter found floating at Monghyr was a mixture mostly of petroleum product and untreated fecal sewage, originating from the refinery and its township, the Commission now proceeds to assess the quantity of the material floating on the Ganga between Monghyr and the effluent outfall point. Such assessment would help to ascertain the possibility and probability of the refinery having discharged large quantities of oily products with the effluent.

The quantity of oily matter floating on the Ganga comprises two parts: (a) the quantity found accumulated at Monghyr ghats at the time of the incident; and (b) the quantity that was floating between Monghyr and the outfall. The quantity depends on the thickness of the layer and the area of spread.

(a) *Quantity accumulated at Monghyr:*

(a-1) *Accumulation at the Kastaharni Ghat:* There was no indication of any estimate of the quantity accumulated at Monghyr ghats, either in the documents supplied by various parties or in the depositions of the witnesses discussed earlier in Chapters VII and IX. It, therefore, becomes necessary to calculate as nearly as possible, the likely quantity that has accumulated at Monghyr Ghats.

It was stated in para 9 of the Memorandum of the Monghyr Municipality that a layer of greasy substance of about $\frac{1}{4}$" thick was found floating "throughout the surface of the Ganges and near the barges." This was on the night of 2-3-1968. On the morning of 3-3-1968, the Chairman, Monghyr Municipality and the Municipal Commissioner observed at the Kastaharnighat that greasy oily substance, somewhat red and yellow in colour was "floating in patches continuously in the Ganges". The layer of thick substance was also found around the Municipal barges in the Ganges.

From these statements it becomes clear that maximum accumulation must have taken place

during the night of 2nd March, 1968. Without adequate lighting it would be difficult, if not impossible, for anyone to precisely state the extent of spread of oil on the river water. One could, however, say about the presence of oil on water around the barges and within a visible distance from the barge. On the 3rd morning, continuous patches of oil were found floating in the Ganges. The Chairman, Monghyr Municipality, stated during inspection of Monghyr ghats by the Commission as well as in his deposition (ER, p.8) that as far as his eyes could reach he saw that there was oil and oil and oil-on the 3rd morning. Also, over a distance of 5-6 miles upstream of Monghyr, the Chairman, Monghyr Municipality and the Municipal Commissioner, during their travel in motor launch, found that there was a continuous flow of oily substance throughout the Ganges and "the whole Ganges was full of a yellow layer of greasy substance." In view of all these factual observations, it can safely be said that the spread of oil on the river was very extensive.

Regarding the thickness of the floating matter, there are divergent views in the estimates given by different people. The affidavits MM series excepting MM 10 (who has said the thickness was 4"), Ex.MMD 15 and the Memorandum of the Monghyr Municipality discussed earlier in Chapters VII and IX are all consistent in stating that the thickness was $\frac{1}{4}$" and more. Sri Misra, as MMW 1, has not given the dimension but has said that there was a thick layer. The officers of the Barauni Refinery who visited Monghyr on 4th and 5th March, 1968, have stated in their reports (Refinery Memorandum, Appendices D and F) that a thin oily layer or a film was observed on the Ganga. This was confirmed by the oral testimony of Sri Tuli, CW 3, (ER pp.335-336) and Sri Hajela, CW 12, (ER, p.1125) who actually visited Monghyr. The refinery officers, however, did not make a quantitative estimate of the thickness. At this stage it must be noted that the thickness of the oily layer would be maximum at the peak of accumulation which took place during the night of 2nd March and the morning hours of the 3rd March, before the day became warm. On a flowing river, one would expect the floating oil to move with the current. However, due to existence of a crescent in the river at Monghyr ghats, the velocity in the crescent would be much lower than in the mid-stream. The pumping barges present at the ghats would further cause obstructions to the movement of the floating scum and would make it accumulate. Thus it is reasonable to conclude that the thickness of the floating matter at the ghats must have been fairly high when it was first observed. The pump Attendant, Water Works Superintendent and the Chairman, Monghyr Municipality, were the only persons who saw it first and their version of the thickness has to be accepted. The refinery officers visited Monghyr ghats at least 36 hours after the incident. During this period, some oil must have slowly flowed downstream, particularly during day time on the 3rd when the solar heat would have softened the floating oily matter. So it is possible that what the refinery officers are stating that the floating layer was thin when they saw it is true. However, the photograph taken by the refinery at Monghyr barges (plates 1, 4 and 5) shows considerable accumulation between the barge and the river bank. This accumulation must be due to the fact that the floating matter was collected and confined between wooden planks, which can be seen in the plate. Obviously this material must have been collected only from the area between the barge and the bank and not much from the river side of the barge. The fact that so much could have been collected from a small area shows that the accumulation in the crescent must have been large.

It is pertinent to note that all the estimates of thickness were visually made. This is usually undependable. In order to show the unreliability of visual estimates, the Commission made a demonstration at Barauni at the time of the examination of the witnesses, wherein different oils—very clear, colourless and very dark—were kept on water in glass beakers. The quantity of oil varied from thin films to thick layers. The sides and bottom of the beakers were covered by dark paper. When some of the witnesses, advocates and refinery engineers who were randomly selected, were asked to note their estimates all the estimates given were wrong. It must, therefore, be said that whereas it is possible to state that an oil film is very thin when the rainbow colours are seen or that a layer is thick when the colours are absent, it could be difficult to make a quantitative estimate of the thickness unless one tries to measure it in a reasonable way. Sri P. K. Misra, MMW 1, was the only person who stated that he dipped his finger (ER, p.41) in the layer and tried to estimate the thickness. Although this method can give erroneous results, still it can give an indication justifying the visual estimate.

All these considerations indicate that the thickness of the floating matter at the ghats on the 2nd and forenoon of 3rd March, 1968, must have been about $\frac{1}{4}$". The statement contained in MM 10 that the thickness was 4" cannot be accepted as it is not at all practicable except when an area is enclosed. If the oil was a thin liquid it would have spread in uniform thickness over a large area, the thickness increasing towards the embankments where due to the waves there would be a tendency for the oil to be pushed and accumulated. Therefore, in order to calculate the quantity of oil, different thicknesses have to be assumed over different areas.

The enclosed table (1) shows the relationship between the thickness of oil layer and the area

required for 1 cu. metre of oil to spread and also the quantity of oil for different areas of spread. These values are used in estimating the quantities of oil that might have been floating on 2nd and 3rd March, 1968.

During the inspection of the Monghyr ghats and in reply to questions put to Shri P. K. Misra and others present during inspection, the Commission were shown the approximate distances on the river water upto which oil was seen floating on 3-3-1968. Sri Misra stated that as far as his eyes could reach he saw that there was oil and oil and oil. In March, the river water would have been about a mile wide at Monghyr ghats. It is, therefore, unlikely that the whole area was covered by a thick layer. It is reasonable to assume that the crescent part was covered with a thick layer and the rest of the water with a much thinner layer. It could be safely assumed that this area would be about 2000 ft. length by about 500 ft. width, average. This would mean 1 million sq. ft. equal to 92,900 sq. metres. Over this area, an average thickness of oil of 5 mm ($\frac{1}{4}$" is equal to 6.3 mm) is assumed as normally the thickness progressively decreases from river bank to the interior of the river. The quantity of floating matter here would then be 464.5 cu. metres or about 418 tonnes.

TABLE 1: *Relationship between thickness of oil layer, area of spread and quantity*

Oil layer thickness		Area in sq.m. required for one cu.m. of oil to spread	Volume of oil spead over (in cu. m.)	
mm	m		50000 sq. m.	92900 sq.m
0·1	0·0001	10,000	5	9·29
1·0	0·001	1,000	50	92·9
5	0·005	200	250	464·5
10	0·01	100	500	929·0
15	0·015	66·7	750	1,393 5
20	0·02	50	1000	1858
25	0·025	40	1,250	2,322·5

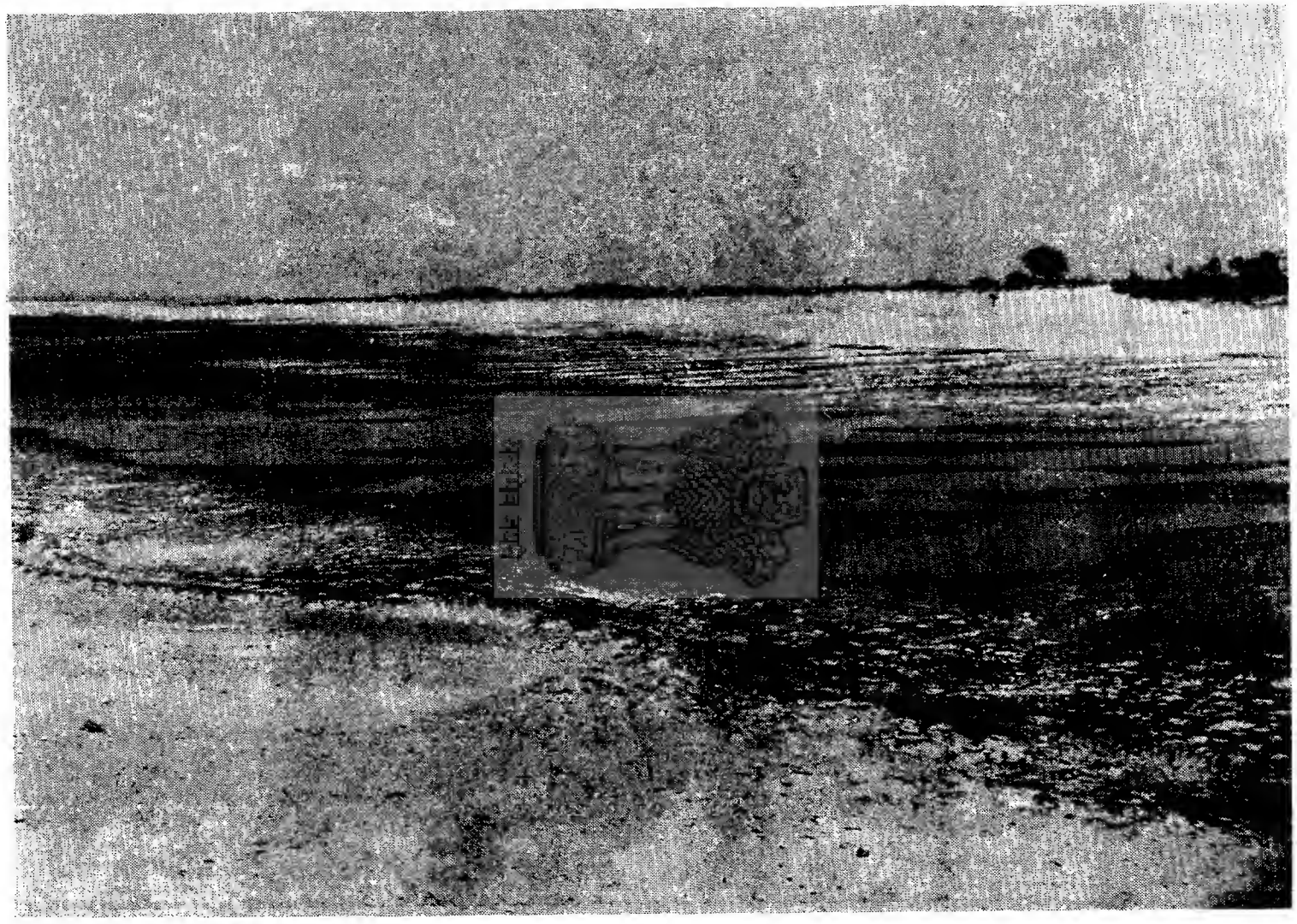
m=metres; mm=milimetres;
sq.m.=square metres; cu.m.=cubic metres.
92·900 sq.m.=1,000,000 sq. ft.
Average density of slop-oil=0·9
To obtain wt. of oil, multiply volumes with 0·9

(a-2) *Accumulation at Water Works*: In addition to the oil accumulated at the Kastaharni ghat on the 2nd and 3rd March, 1968, oil was also found at the Kasturba Water Works. It was spread over the water in the rectangular settling tanks whose surface area is about 18,400 sq. ft. the slow sand filters whose area is 4,000 sq. ft., the Rapid Gravity Filter whose area is 2,820 sq. ft. and the two filter beds inside the gravity filter whose area is 470 sq. feet. On the water in these units it was stated that a thick layer of oily material was found on the night of 2nd March, 1968. Shri P.K. Misra stated that this layer is also about $\frac{1}{4}$" thick. Assuming a thickness of 5 mm in this case also the quantity spread over an area of 2400 sq. metres (equal to 25700 sq. ft.) would be about 12.0 cu. m.

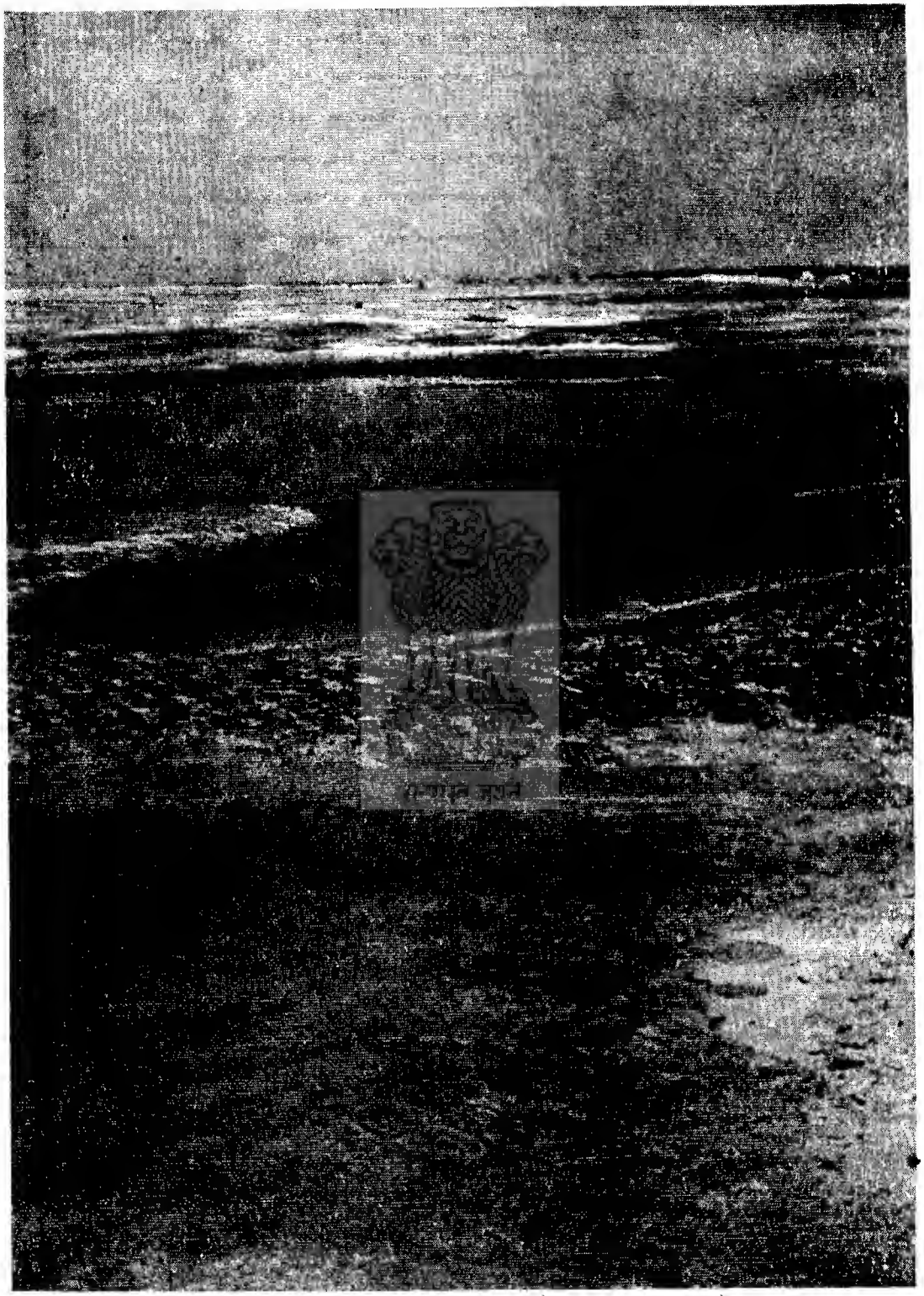
(b 1) *Oily matter floating on the river upto the confluence*: Beyond this crescent area, in the main river stream, much smaller thickness has to be assumed. In this connection it is difficult to believe the visual assessment as stated in the Memorandum of the Monghyr Municipality (para 17) that "the whole Ganges was full of a thick yellow layer of greasy substance" because in the warm climate as was prevailing on the 3rd March, 1968, particularly during mid-day when the journey by motor launch was undertaken, and when the solar heat would be maximum, the greasy material could easily have softened and spread over a wider area reducing the thickness of the layer. As it is normally difficult to estimate the thickness merely by visual observation, the use of the words "thick layer" must be taken to mean more than the normal. Any way it is after all a guess. But from this it can be reasonably assumed that the oil layer was not so thin but sufficiently thick to give the appearance of a substantial quantity floating on the water. It would, therefore, be more reasonable to assume an average thickness of 1 mm over the distance of 5·6 miles over which the journey by motor launch was conducted. It is also more likely that in the main stream the oil would have been flowing as a continuous patch along the main current, namely the central part. Assuming therefore, that the oil was spread over an average width of about 500 metres (about 1600 ft.) and a distance of 8 kilometres (5 miles) with a thickness of 1 mm. the total quantity works out to 4,000 cu. metres or 3600 tonnes.

For the oil content upstream of this distance, the affidavits of Shri Harnandan Prasad, the then Secretary, Local Self Government, Department, Government of Bihar (BG-1) and of Shri B.T. Tripathy, then Additional Chief Engineer, Public Health Engineering Department, Government of Bihar (BG-2) speak to their aerial inspection, flying low, of the whole river and their having observed continuous film of oil throughout Ganges and yellowish foams of greasy matter floating on the surface. Here again it is difficult to judge the thickness of the oily film, though one could observe presence of oily film.

Two possibilities may be considered regarding the thickness of the layer. If oil was continuing to flow from Barauni on the afternoon of 3rd March in substantial quantities, the thickness would perhaps be 1 mm or even more. If, however, the bulk of the pollution had already taken place and oil had flowed out and only residual oil was being washed by the effluent flowing out on the 3rd March (afternoon), streaks or thin layers of oil would have been flowing.



Old channel—A view of the flow on 23.5.1968.



The old permanent channel—Traces of deposits can be seen—Chainage 3800 *M appx.* (*Ex.* 21)
23.5.68.

In view of the fact that there was no complaint by the Municipality that continuous large quantities of oil were floating towards Monghyr on the afternoon of 3rd March, it is reasonable to assume that the major part of oil flow had already taken place and that only thin layers of oil were flowing as a result of washing away of residual oil from the effluent main and channel. The following estimate is made:

> 0.1 mm thick layer over a distance of 20 kms. and of 500 m. width, would be equal to 1000 cu.m. A layer over another 23 kms. distance upto the confluence of the effluent channel with the river Ganga and a width of 500 m. and a thickness of 0.01 m. would work out to 115 cu. m.

(c) *Oily matter in the channel upto the outfall*: The last stretch of 13 kms. (app. 8 miles) is from the confluence to the effluent outfall. This is the effluent channel itself. The oil content in the channel would have to be estimated considering various factors which are now discussed. The reports of inspection by refinery engineers appended to the refinery memorandum, the photographs of the channel (plates 16 and 21) and the survey drawing PH/D/77 dated 24-5-68 clearly establish that the channel was not having a uniform width and depth like a specially constructed channel but was having varying widths and depths and many pools and lagoons, as is generally the case with channels naturally formed on dry river beds. For most part, however, the channel was narrower than the main river.

In order to calculate the surface area of the effluent in the main channel, the Commission relies on the survey of the channel conducted by the refinery in response to a question issued by the Commission. The course of the channel and the widths of the channel at different places as found by the survey were given by the refinery in their drawing PH/D/77 of 24-5-1968. The length covered by the survey was upto a large stretch of water which was obviously mistaken by the survey party as the confluence with the main river, as admitted by Shri T.S. Rao, CW 10 (ER, p. 945-946). This could only have been a large lagoon due to the fact that Shri Harnal, Shri Ayyar and Shri Hajela stated (Refinery Memorandum para 11) that the channel upto the confluence was about 8 miles (12.8 Km.) whereas the survey drawing covers a distance of only 5.6 kms. The Commission, therefore, considers that the channel was, in fact, about 13 kms. and survey was conducted only upto 5.6 kms. Using the lengths of the channel and the average widths noted in the survey drawing, the surface area of 5.6 kms. of the channel works out to about 292.000 sq. m. The unsurveyed part of the channel was 7.2 kms. long and had large pools and lagoons. Assuming an average width of 100 m. over this length, the surface area would be 720,000 sq. m. The total surface area over the whole channel would thus be 1,012,000 sq. m. or say 1,000,000 sq. m.

Further, as was spoken to by Shri Kumra, CW 7, at p. 625-ER, the effluent channel was earlier connected with the river from the upstream side which got silted up recently and has disconnected from the main river. He says again at p. 626 that it has no upper connection with the river. It can be said that the flow in the channel was that of the effluent itself. Due to this low flow rate and the rising and falling bed of the channel, the oil concentration would be higher than in the main river downstream of the confluence. Most of the oily matter present on the effluent on the 1st March, 68, would have flowed downstream from the channel, for the reason that the freezing and melting phenomena and the sudden release of accumulated oil were already considered (Chapter IX) to have been established facts. It is, therefore, reasonable to assume that the channel had only pockets of oily matter, mostly along the sandy banks on the night of 2nd and morning of 3rd March, 1968.

In addition to floating oil, there must have been substantial quantities of thick waxy deposits on the sandy channel banks because these were noticed even on the 9th March, 1968, by Shri Kurien and even in May, 1968 when the channel was surveyed by the refinery in response to one of the questions issued by the Commission (plate 16). On the other hand, during the first week of March, 1968 oil dips in the guard basin sections of the refinery were high and oil was seen by the operators in the E.P.S. sump (BRD 5 and BRD 9). Also, the oil content in effluent samples was quite high early in March (BRD 15). So fresh quantities of oil though perhaps smaller than in late February, 1968 must have been flowing with the effluent.

It would therefore be reasonable to assume an average thickness of 1 mm. of oily matter (compared to 0.01 mm. thickness) on the main river immediately downstream of the confluence on the whole surface of the effluent in the channel, assuming also that all waxy deposits on the banks are spread out as liquid or the effluent The oily matter in the channel would then be equal to 1000 cu. m.

Thus the total quantity of oily matter present on the effluent in the channel and the whole of the Ganga hetween the confluence and the Kastaharni Ghat would be as summarised below:

	cu.m.
1. Accumulation at the ghat at Monghyr ..	464·5
2. Floating at Kasturba Water Works ..	12·0
3. Floating on the main river :	
For 8 kms. upstream of Monghyr ..	4000·0
For the next 20 kms upstream ..	1000·0
For the next 23 kms. upstream up to confluence	115·0
4. Accumulated in the channel	1000·0
Total ..	6591·5

This completely excludes the oily matter that must have been seeping continuously into the sandy beds along the banks throughout the period of accumulation in the channel. This seepage would have been substantial during day time due to the softening and melting under solar heat. It would in fact be reasonable to believe that the top layers of the sandy bed along the banks must have been saturated with oily and waxy matter. It is not possible to precisely estimate this seepage. It is, therefore, reasonable to conclude that the above estimate of about 6590 cu. m. is quite realistic; this would be about 5900 tonnes.

4. *Possibilities of discharge of large quantities of oily matter by the refinery*: It is now necessary for the Commission to find out whether about 5900 tonnes of oily matter could possibly have been discharged by the refinery and if so, the probability of such a discharge and the period over which such discharge could have taken place.

(a) *Quantity of petroleum product in the floating matter*: It should be stated here that the quantity of 5900 tonnes estimated above is a mixture of petroleum products, fecal sewage and some algal and other vegetative matter formed in the channel. The refinery township is estimated to have a population of 5000. Assuming an average rate of about 1 lb. fecal sewage per person per day under Indian conditions the solid quantity would be 5000 lbs. per day. Now, for the purpose of estimating the quantity of fecal matter contained in the 5900 tonnes, the period of discharge and the quantity that might have undergone some decomposition and settling have to be considered. Regarding the period, it is reasonable to assume that since there is some river flow into the channel during October and November and since the channel gets disconnected from the river from December onwards all the fecal matter discharged during December, 1967 and January and February 1968 *minus* the part that might have decomposed and settled would have got accumulated in the channel with the oily matter. Thus the quantity of fecal matter over 3 months is 450,000 lbs. Of this, 25 per cent is assumed to have decomposed, because of hindrance caused by oily contamination. Thus the net fecal matter is 338,000 lbs. equal to 154 tonnes.

There is no precise way of estimating the algal and vegetative growth in the channel, which might have got admixed with the oily matter. Deducting a round figure of 400 tonnes for fecal, algal and other vegetative matter, the quantity of the petroleum product in the floating matter would be 5500 tonnes. Now the questions to be answered are: whether this quantity could have been discharged, and, if so, in what time.

(b) *Whether 5500 tonnes of oily matter could have been discharged by the refinery?—Possibilities*: Since all the oily matter flowing with the effluent out of the refinery premises must pass through the atmospheric syphon of the guard basin No. 1 in Sector VI of the refinery, the quantity of oily matter ultimately found flowing with the effluent would, therefore, depend upon the efficiency of the functioning of the Guard Basins. The Guard Basin No. 1 is the last point from which the effluent leaves the refinery premises. After leaving the guard basin there is no other place where the effluent can be stored for any substantial period or diverted and the effluent has to be pumped out from the EPS into the Ganges. As already noted in Chapter XII dealing with the inspection of the refinery by the Commission, guard basin No. I is the only unit concerned with the ultimate separation of oil from the effluent before the latter flows out through the atmospheric syphon. Guard Basin No. II, as a source, of oil flowing out into the effluent pipe was already ruled out on the basis of the inspection.

Therefore, whatever be the quantity of the oil that might have been entering the units in Sector VI preceding the guard basin, as long as the Guard Basin No. 1 functions fully satisfactorily, oil beyond permissible limits cannot go out of the atmospheric syphons. If the guard basin is really maintained and operated efficiently, oil can be prevented from flowing to the Ganges, even if there is occasional overloading of the basin sections. Continuous or frequent overloading of guard basin and its malfunctioning could result in serious out-flows of oil.

The refinery authorities have been explaining that the oil content of their effluent flowing out into the Ganges was always within the specified limit of 50 ppm. The quantity of refinery effluent discharged during the months October, 1967 to February, 1968 totalled to nearly 3.2 million cu. metres. Assuming that maximum of 50 ppm oil concentration was maintained in the effluent throughout the period of October, 1967 to February, 1968, the total quantity of oil that must have left with the effluent during the five months period comes to about 159 tonnes, *i.e.*, an average of nearly 32 tonnes per month. Even if all this oil discharged over a five months' period had separated completely out of the effluent water, got stagnated somewhere and then flowed to Monghyr in one lot, it should have amounted to only 159 tonnes. In fact, such perfect separation would never take place. Against this, the estimated quantity, as shown in Section 4 above, that has accumulated at Monghyr and that was floating in thin layers on the rest of the river was about 5500 tonnes.

Thus the figures are not at all comparable. It should also be noted that whatever oil that might have passed with the effluent, whether within or beyond permissible limits, during the months October and November, 1967, it would

have mostly flowed away with the current because during these two months some river water was still flowing into the effluent channel from the upstream side. So the disparity between the quantity found floating between Monghyr and the effluent outfall and the maximum quantity that could have been discharged by the refinery if the oil content of the oil was having maximum permissible 50 ppm concentration would increase further. It is, therefore, impossible to accept the contention of the refinery authorities that the oil content of the effluent was always within permissible limits. Substantial quantities of oil either as slugs or as layers or as emulsion and suspension must have flowed with the effluent over prolonged periods.

In order to ascertain that it is necessary to consider the functioning of the Guard Basin as per design and as actually prevailing.

(c) *Functioning of the Guard Basin No.* 1: The enclosed figure No. 1 shows the design of a Guard Basin section. As already explained in an earlier chapter, Guard Basin No. 1 consists of three sections, each about 140 metres long and 35 metres wide at the top and 128 metres long and 23 metres wide at the bottom. The basin is thus a trapezoidal earthen pit. It has seven atmospheric syphons at one end, farthest from the end where the effluent enters. The syphons operate continuously, *i.e.*, at any given instant the quantity of effluent entering the section at one end continuously flows out of the seven syphons at the farthest end. The effluent entering the basin at any given time has to push the liquid ahead, already existing in the basin, and travel the whole length before it reaches the syphons at the discharge end. The liquid existing in the basin, therefore, acts as a sort of hydraulic barrier to the freshly entering effluent. The travel of the effluent from the inlet end to the discharge end is thus slowed down because of: (1) the reduction in the velocity of the effluent at the entry to the section; (2) the length of the section; and (3) the fact that the fresh effluent has to push in the longitudinal direction, the effluent already existing in the section.

(i) *Detention time*: Thus the basin is designed to provide a detention time of two days with a view to ensure efficient separation of oil from water. An important assumption underlying this estimate of detention time is that the basins are kept clean and the bed level does not arise by accumulation of deposits. For, if the basin were shallow or merely a flat paved floor, the liquid entering it would flow away much faster than in a deep basin. Raising of the bed level by deposits would, therefore, increase velocity of flow, reduce detention time and also create turbulance which does not permit quiescent conditions and proper oil separation. When the Commission inspected the guard basin sections, one section, which was not in use, contained considerable dark deposits, rising at some places upto 2 ft. height. On enquiry, these deposits were stated to be partly coke powder which used to be admitted earlier into the basins. Shri Hajela admitted that coke fines accumulate in the pumping pit (job 525) and later pumped to Guard Basin (ER p. 1190). It is, therefore, to be concluded that over some considerable period, deposits have accumulated in the guard basin sections, reducing their effectiveness to separate oil, particularly from emulsions mud and sludges which were referred to in the log books (BRD-1B, BRD-5F) and letters of Shri Hajela (BRD-62).

BRD-5F shows that the Operators and Foremen were aware of the fact that too much sludge and coke was depositing in the guard basin resulting in difficulties even to take dips. They also noted that the presence of sludge and emulsion in the guard basin was resulting in some of it passing through syphon. It appears that the supervisory officers of the refinery did not take adequate care on the condition of the guard basin sections.

Even if the basin sections were clean, emulsions and coke particles mixed with oil would take much longer to separate and may even remain almost permanently suspended, unless some other treatment is given. Also, acid and alkali washings and presence of salts are known to increase emulsification of oil in water. Low temperatures drastically reduce the efficiency of separation of oil from emulsions. This is the reason why the emulsions are heated to facilitate separation. All these factors would reduce the effectiveness of separation of oil from the water in the Guard Basin sections so that considerable amount of oil is likely to remain as emulsion below the clear oil layer and may even reach the mouth of the open arm of the syphons and may find its way to the effluent pumping station. Such emulsions, depending upon the oil and water ratio, could still indicate the colour of the water finding paste as if it was a water cut and lead to misleading dips.

(ii) *Atmospheric syphons*—Another important aspect of the functioning of the guard basin section refers to the atmospheric syphons located at the discharge end, through which the effluent finally over-flows into a manifold pipe. The syphon consists of an inverted U pipe, 200 mm dia, with one open ended short arm and the other arm connected to the manifold pipe below. On the bend of the syphon an open pipe, 15 mm dia is welded. The dimensions and location are shown in the figure 1. The case of the refinery is that since the open arm of the atmospheric syphon is about 100 cm. deep, no oil can ever flow through the atmospheric syphon unless the depth of oil layer exceeds 100 cms. It should be so according to the design. But under the following conditions, oil can flow through the syphons:—

1. If the separation of oil is not efficient for any reason, suspended oil particles

or emulsions reach the mouth of the syphon and flow out. This is quite feasible, particularly under cold climates and with mixed slope oils which are difficult to separate. Under these circumstances the oil content of the effluent can exceed permissible limits.

2. When the deposits build up substantially on the bottom of the Guard Basin sections, turbulence is created in the basin, resulting in improper separation of oil and its escape through the syphons. Also detention time is reduced, as discussed earlier, with the same result.

3. If, for any reason, the vent pipes on the syphon bends are choked, the syphon which normally works as an overflow pipe at atmospheric pressure, would work as a suction syphon and vortices are formed around the open arm, resulting in the oily top layer entering the vortex and then getting rapidly sucked out. The possibility of vortex formation was admitted by Mr. Hajela in his deposition (ER, p. 1194). The possibility of the vent pipe getting choked was denied by the refinery witnesses. On the other hand, there are actually many possibilities of such choking taking place, as for example:

(a) flowing of emulsion and sludgy matter through syphons;

(b) flow of coke particles either alone or mixed with oil and sludge;

(c) solidification of oily and waxy matter, during cold months, in the syphon bend.

The log book entries (BRD-5F, BRD-1B) show that there was sludge and emulsion in Guard Basin sections on many occasions. Whenever the liquid rises to the level of the upper surface of syphon bend, the sludge can get deposited at the bottom of the vent pipe and choke it temporarily. Immediately there would be a powerful suction of the liquid and also some sludge from the bottom, depending upon the power of the suction. If the sludgy deposit in the vent pipe is soft enough, it can get sucked into the flowing liquid, clearing the vent pipe and breaking the suction. If, however, the sludge hardens over a period into a crust, the suction can be powerful enough to cause vortices around the open, arm. causing flow of oil by suction. This would continue until the vent pipes are cleared of the choke.

It is also well known that formation of vortices would tend to increase when there is turbulence or flow in the liquid. Considering the effluent flow rate into it (as operated 12500 M^3/day) the linear velocity of the liquid drops to about 0.0018m/sec. because the effluent, after entry into the section, distributes itself and flows through the entire cross-section of the basin; this velocity exists, say, at the middle of the section where disturbance would be minimum. The velocity exists, say, at the middle of the section cause when liquid level is constant, all the effluent entering the section must leave the basin through the syphons. Using the full cross-sectional area of the syphon bends, the velocity in the syphon would be about 0.66 m/sec. This velocity profile along the length of the section and the maximum velocity at the syphon mouths would aid the formation of vortices when the vent pipe is choked.

During their inspection the Members of the Commission particularly noted that the syphons are at a distance of about 6 metres from the edge of the embankment and questioned the authorities how exactly the vent pipes were cleaned. The Commission was told that a long wire or a long bamboo pole to which a thin rod or wire is fixed at right angles at one end is held by the Operator standing on the bank and the bent or right angle arm is introduced into the 15 mm dia. vent pipe. Shri B. D. Gupta in his deposition (ER, p. 171, 256) also spoke to the use of wire or bamboo for cleaning the syphons. By moving the pole or rod up and down, cleaning is expected to take place. This operation is obviously difficult and is, at best, very inefficient because:—

(1) due to the distance of about 6 metres (about 20 feet) between the Operator and the vent pipe, the Operator cannot use sufficient strength to move the cleaning rod or bamboo up and down. This would be more difficult when the obstruction in the vent pipe is hard;

(2) due to the narrow diameter of the vent pipe, and the distance, even insertion of the cleaning rod from a distance is difficult. Due to the presence of large volume of effluent liquid before him and absence of any guard railing on the bank, the Operator tends to play safe in his effort and would not exert much in introducing the rod. If, for safety and better effort, he goes back from the edge of the bank, his distance from the pipe increases, making it more difficult to manipulate the operation. All these factors make the cleaning operation strenuous and inefficient and the operators can easily ignore the work and shirk duties; and

(3) under the difficult operational conditions mentioned above and whenever lights failed in Guard Basin area, about which frequent entries were made in log books (BRD 1, 8-1-68, 25-1-68, BRD 5, 29-1-68, 30-1-68) and in cold months, there is every likelihood of Operators totally ignoring the cleaning operation in the night shifts when there was particularly the possibility of oily and

waxy matter hardening due to cold. In fact, there are entries in BRD 67 (22-12-67, 5-1-68, 7-1-68—all night shifts) that skimming from Guard Basin sections could not be done properly in winter months because of slidification of oily matter in the Guard Basin sections.

It is perhaps after noticing the difficulties and lapses in cleaning the vent pipe that the refinery authorities provided, a floating platform on drums so that the Operator can get near the syphon and effectively clean the vent pipe. There was no evidence on the frequency of the use of the raft. Even with the raft, it is doubtful if the Operator would have used it in the night shifts in cold months when solidification would have been maximum. Further, it is not necessary that all vent pipes should be choked at the same time, to occasion the syphoning out of the oil. Even if one pipe is choked, that particular syphon develops a powerful suction, causing excessive flow of oil or emulsion or sludge, thereby exceeding the permissible limit of oil content. It may be noted that if by any chance all the vent pipes were choked at one time and if the obstruction remained sufficiently hard, then the suction through the syphons would be so quick as to empty out the liquid of 1.15 m. depth (*i.e.*, the total height of the open arm of the syphon) in 3.2 hrs. Such discharge is a possibility if the Guard Basin sections go unattended in winter night shifts over a stretch of nearly 6 hours. A careful study of the log books BRD 67, 5 and 3 for the period December 1967—February 1968 show that there was practically no skimming from guard basin during most of the night shifts, except immediately after complaints were received that oil was passing to Ganges—BRD 67, 11—14 January 1968 and 24-25 February 1968. One can only hope that all the syphon vents did not choke at the same time.

Considering these possibilities, it appears that the design of the atmospheric syphons and the vent pipe diameter could be risky, particularly when the guard basin sections are not kept clean, and too much oil of high pour point and emulsions are allowed to accumulate therein. The design, as it is, demands extreme vigilence and very good maintenance, when the syphons can function well.

(iii) *Dips*—According to the memorandum submitted by the Barauni Refinery (para 39, p. 38), if the design limit of oil content has to be maintained in the effluent from the guard basins, only "a very thin oil layer" should exist on the effluent water in guard basin sections. The main clue to the operation of the guard basin sections is given by the oil levels in these sections which are given by the oil dips taken by the Operators. Considerable controversy arose on the reliability, interpretation and the significance of the oil dips. The learned refinery advocate has contended that the oil dips during the later half of February 1968 are undependable and cannot be given undue importance. The general reliability of the dips, despite occasional errors due to bad measuring devices has already been discussed in Chapter XI.

Shri Y. D. Puri (ER, p. 1101), Shri B. D. Gupta (ER, p. 199-200) and Shri S. G. Hyder (ER, p. 507—509), have stated that it was absolutely safe to maintain oil dips upto 70—75 or even 90 cms. In the final guard basin sections. Theoretically, according to the design of the section, if the effluent is clear and flows stedily, even if 90 cms. of thin oil floats on the effluent, no oil should flow out of the syphons if the vent pipes are clean.

But during the inspection of other refineries, the Commission Members were told everywhere that it would be 'unthinkable' to maintain even a thin continuous layer of oil in the final guard basin section and if the layer was continuous it should indicate very bad operational practice. Nothing more than a patch of oil layer should be permitted in the final guard basin section, according to the experts of other refineries. The Commission fully agrees with this view and does not accept the contention of the refinery advocate and the statements of the refinery engineers who had deposed before the Commission that it is safe to maintain oil level even upto 70 or 90 cms. in the guard basin sections.

In this connection, the Commission carefully examined the oil dips over the period 1966 to February 1968. The enclosed table (2) shows the dips in guard basin sections during 1966—68 and the number of days having different dips in each month. These data are plotted in the enclosed figure (2) for each section in the guard basin. The following are clearly observed:—

(1) There is a distinct trend of higher dips prevailing for longer periods progressively from 1966—1968 which indicates deteriorating operating conditions of Sector 6.

(2) The dips were much higher and remained so for much longer periods in the colder months particularly in November, December, January and February than in other months. The dips were lowest during the hot months, *i.e.*, May, June and July.

Another aspect of the dips is the timing. As a rule all dips were noted at 7.00 a.m., 11.00 a.m., 1.00 p.m., 3.00 p.m., 9.00 p.m. and 1.00 a.m. Only the dips at 7.00 a.m. are used by the refinery authorities in their calculations. On many occasions, dips in Guard Basin sections were not noted in the afternoons and nights. If during those hours, excessive quantities of oil have entered Guard Basin sections along with effluent from oil separators, the dips could have exceed-

TABLE 2: VARIATION OF DIPS IN GUARD BASIN SECTIONS OVER 1966—68

(Figures represent the No. of days in each month on which specific dips were measured)

Month/Year		January			February			March			Agril		May		June		July		August		Sept.		Oct.		Nov.		Dec.	
		66	67	68	66	67	68	66	67	68	66	67	66	67	66	67	66	67	66	67	66	67	66	67	66	67	66	67
Dip cms.	Basin																											
0—2	I	10	..	..	..	Dry	..	..	Dry	..	..	Dry	..	Dry	1	..	1	..	..	..	1	..	..	..	..	..	..	..
0—2	II	10	1	..	1	1	..	..	..	..	..	..	..	3	17	7	11	..	3	..	..	..	8	1	13	..	..	..
	III	7	..	..	1	..	..	..	..	..	..	..	1	2 (trace)	14	..	24	..	..	..	1	..	1	1	..	..	..	..
2—3	I	..	..	..	..	Dry	..	..	Dry	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..
	II	6	..	..	1	..	..	..	..	..	..	..	1	4	5	2	14	24	5	..	5	..	12	5	1	..	8	..
	III	9	..	..	1	..	..	..	..	..	..	..	2	1	4	11	..	23	13	..	6	..	19	..	14	..	8	..
3—5	I	..	1	..	..	..	1	..	..	..	..	..	..	..	7	..	..	..	8	..	3	..	..	..	..	..	..	..
	II	..	14	..	8	..	..	6	16	..	1	..	6	2	8	7	..	4	12	13	7	6	..	12	..	..	12	..
	III	..	15	..	..	4	..	5	17	..	..	..	..	5	..	2	1	3	..	9	5	5	..	19	..	..	11	..
5—10	I	..	..	..	..	2	1	..	..	..	..	..	..	1	..	..	..	..	..	..	2	..	..	..	..	..	..	..
	II	..	2	1	2	5	..	9	1	..	12	2	19	17	..	13	..	3	..	8	8	8	..	8	..	15	..	..
	III	..	2	1	6	3	..	9	11	..	13	..	16	2	..	14	..	4	..	12	1	2	..	8	..	2	..	1
10—15	I	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..
	II	..	6	..	..	9	6	..	10	..	..	5	..	5	..	..	..	..	..	2	2	6	..	3	..	11	..	1
	III	..	5	1	..	4	3	..	..	..	..	17	..	20	..	..	..	..	..	3	..	10	..	2	..	15	..	..
15—20	I	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
	II	..	3	15	..	5	6	..	..	..	..	8	..	..	..	..	..	..	..	7	..	7	..	..	..	1	..	4
	III	..	4	15	..	11	12	..	..	..	..	1	..	..	..	..	..	..	..	..	..	9	..	..	..	6	..	2
20—30	II	..	..	10	..	7	13	..	..	..	..	8	..	..	..	..	..	..	..	1	..	2	..	..	..	2	..	5
	III	..	..	12	..	1	10	..	..	..	..	11	..	..	..	..	..	..	..	1	..	3	..	..	..	2	..	12
30—40	II	..	2	5	..	..	1	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7
	III	..	..	2	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..	..	5
40—50	II	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
	III	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
50—70	I	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	II	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	III	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
70—100	II	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	III	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total days oporated.	I	11	1	..	..	7	3	..	..	..	..	..	1	9	..	1	..	8	..	10	..	..	..	..	..	..	..	..
	II	16	28	31	12	27	29	15	27	..	13	28	26	31	30	29	25	31	20	31	22	29	20	29	14	29	20	19
	III	16	26	31	8	23	29	14	28	..	13	29	19	30	18	27	25	30	13	25	13	29	20	30	14	29	19	20

ed 100 cms. resulting in oil flow through syphons even if the vent pipes were clear.

These trends have a scientific significance. In colder months separation of oily phase from water becomes difficult due to the physical condition of the oily phase; its viscosity and density incerase in cold months, making separation inefficient. Due to poor separation, oily material would remain finely dispersed in suspension in the effluent even though the volume and length of the guard basin sections are quite high. Obviously, it might be asked how separation is affected in colder climates in the western countries. The answer must be found in the accepted prachtice that by the time the effluent goes to guard basin or final retension ponds, very little oil should be permitted to be present in it, thereby minimising the problems of separation.

The relatively longer period of high dips in August and September 1967 is perhaps due to the general deterioration of the operational efficiency of guard basin sections and oil separators in 1967 compared to 1966. Another likely reason is the tendency to greater emulsification during the humid and hot months of August and September, which also constitute monsoon and post-monsoon periods. It is worth noting that even under deteriorating operating conditions, during the dry and hot summer months, the floating material must have been thin and separation of emulsions as well as dust would have been easy and this would have facilitated skimming from Guard Basin sections, resulting in consistently low oil dips.

The high oil dips for relatively long periods in the cold months would also make skimming operation difficult, due to solidification of oil which was explained earlier. Due to non-skimming or insufficient skimming the oil dips were maintained high for continuous long periods,

during January-February 1968. The general practice of the refinery of permitting high oil dips in Guard Basin sections and their mistaken notion that it is safe to do so would add to the operational difficulties. Very likely, therefore, the oil might have remained in suspension in water and flowed out of the syphons as suspensions even when the vent pipes were clear.

The dips in guard basins thus clearly show that there was progressively deteriorating operation of the guard basin sections with reference to the oil levels from 1966 to 1968 which the refinery authorities failed to notice.

It is also necessary to examine whether such high oil dips as were being maintained were envisaged and what was the thickness of the oil layer in the Guard Basin sections that was envisaged according to the design, under steady operating conditions.

According to the design the oil entering the Guard Basin sections comes along with the effluent water flowing out from the oil separators and also partly from the emergency basin 1, in Sector 6. As already explained in an earlier chapter, the effluent from various sectors of the refinery passes through the sand trap and enters the oil separators. Here as much oil as possible is skimmed out and the remaining unseparated oil flows with the effluent into the Guard Basin sections. The design envisages a maximum of 150 ppm of oil in the effluent flowing out of the oil separators and entering the Guard Basin. This oil content is to be reduced to 50 ppm maximum by settling in the Guard Basin sections before the effluent flows out to the effluent pumping station. Taking the design quantities of effluent flow (12508 cu.m./day) and assuming that separation is achieved so that the oil content is always reduced from 150 ppm to 50 ppm, the quantity of oil separated in each Guard Basin section should be about 1.5 cu.m. per day. If this quantity spreads uniformly over the surface of the effluent (3300 sq.m.) in the Guard Basin sections the thickness of the oil should be 0.045 cm. The actual thickness of oil layer during the period November 1967 to February 1968 has rarely been below 10 cms. and was about 25 cms. on the average, the maximum recorded dip going upto 70 cms. leaving the controversial dips of 90 and 100 cms. on 25-2-1968. It is thus clear that the oil layer in the Guard Basin sections has been at least 200 times and often more than 500 times the thickness anticipated by the designers which was "only a very thin layer." This was admitted by Shri Y. D. Puri in reply to questions put by one of us (Dr. Krishna) (ER. pp. 1120-1121). The Commission finds it extraordinary that Shri Y. D. Puri who was Plant Manager of the OM&SR Division at the time of the incident admitted that he "did not know the design conditions (of the Guard Basin sections) till to-day" (ER, p. 1117) and yet he was asserting that 70 cm. oil dip was a "comfortable level of oil in the guard basin."— (ER, p. 1101).

(iv) *Analysis of the effluent*—It is seen from the above discussion that the Guard Basin No. 1 sections were not being operated and maintained satisfactorily and that there was every likelihood of oil or emulsion going out with the effluent through the atmospheric syphons. If that be so, the analysis of the effluent from the Guard Basin No. 1 sections must show high oil content, *i.e.*, more than 50 ppm. But the test results recorded by the refinery laboratory do not show high oil contents in the effluent. It is, therefore, necessary to examine the accuracy of the analytical data.

The result of analysis for oil content of the effluent sample not only depends upon the accuracy of the analytical procedure but also on the reliability of the sample itself. The Commission has been informed that standard and approved methods have been used by the refinery laboratories for estimation of the oil content of the samples. There is no reason to doubt this information and the Commission is of the view that the analytical method used was dependable subject to normal experimental errors. Regarding the sampling method also, the refinery authorities maintained that their staff are properly trained and take samples according to correct procedures. Here the Commission is not prepared to accept this version of the refinery for the following reasons:

(a) The sample of the effluent from the guard basin sections has to be collected from the manholes which are quite deep and the effluent flows quite fast. It is, therefore, normally difficult to collect a reliable single sample from a fast flowing stream. If hourly samples were collected and a composite sample prepared from them, the result would have been more reliable. But a single sample can be hopelessly wrong. The refinery has never collected hourly effluent samples to prepare composite sample for the day.

The difficulty in collection of the effluent sample was noted by the Shift Foreman after the incident, on the 6th March, 1968 (BRD-10, 10-6 shift) apparently when the authorities have started taking care and making investigations. The noting reads: "one sample of Guard Basin outlet from the discharge manhole taken and Mr. Lakshman, Shift D/H took it to the Lab. It was not possible to take sample from rope and bottle or sample thief. It was tried by me and Mr. Laxman. Sample anyhow taken personally by getting down in the manhole. There is a lot of vapour and the place is very slippery. It is very nauseating also. It is very risky and hazardous to take sample like this..." If this was the situation on the 6th March, there was every reason to believe that the condition in the manhole was not pleasant prior to the incident

to permit proper sampling to be done. Obviously the Foreman thought it proper to note all these difficulties because the District authorities were already dealing with the complaint of pollution and a reliable sample was being insisted upon by the refinery authorities. The above note refers to night shift. Even in the day shift, the hazardous and nauseating conditions would not be any less than those noted above except that a person can observe the manwhole and the effluent. When the Commission inspected on two occasions, it was late afternoon time and the liquid could not be seen clearly through the deep manhole except as a dark fluid, although the effluent was clear. From this it can safely be stated that prior to the incident, the Operators did not take proper samples from the manholes.

(b) Even if a single spot sample collected properly showed that the oil content was within permissible limits, that would not ensure that the oil content of the effluent during the remaining part of the day would be within limits, particularly in view of the poor operating conditions of the Guard Basin sections which were discussed earlier.

(c) A careful study of all the log books giving test data (BRD 6, 14 and 15) showed that during the period June to September, 1967 (120 days) the analysis of the effluent samples from the Guard Basin was reported only on four days, once each in June and July and twice in September. During the period October 1967 to February 1968 (150 days), guard basin effluent samples were tested on only 22 days which were mostly collected during the morning shift (about 10.00 a.m.). Except on two occasions all the samples were having oil less than the maximum limit of 50 ppm. The sample of 26-2-1968 had 42 ppm. However, after the incident, from 3-3-1968 to 7-3-1968, when the investigations on the complaint have been started and there was a commotion in the public, 15 effluent samples from the Guard Basin No. 1 and 3 from EPS were collected and tested. Except 3 samples, all of them contained much higher than 50 ppm. of oil. Two of these samples collected—by the Factory Inspector had 675 ppm. and 2000 ppm. oil. The others were all collected by the refinery staff and even they had high oil content mostly above 80 ppm. and one had 121 ppm. This clearly shows that the refinery authorities were obliged to take care in sample collection after incident and that carefully collected samples, even after the incident were having much higher oil contents than permissible.

It is, therefore, quite clear that prior to the incident no proper care was taken to collect reliable effluent samples and the frequency was far too insufficient. In fact, it shows a serious lack of appreciation of the importance of effluent quality control. In these circumstances, the Commission cannot accept the arguments advanced by the Counsel for the Refinery and the statements given on oath by Shri B. D. Gupta, Shri Tuli, Shri Hyder and Shri Puri that because the test data on the effluent samples showed oil within permissible limits, no oil beyond permissible limits could have gone to the Ganges even if the dips in the Guard Basin were high. The Commission is definitely of the view that the sections of Guard Basin No. 1 were maintained in an unsatisfactory condition and operated inefficiently for long periods, resulting in high dips and flow of oil or oily emulsion and sludge to the Ganges in substantial quantities.

5. *Probabilities of discharge of 5500 tonnes of oil by the Refinery*—Having established that under the unsatisfactory operating conditions of the G.B.I. sections, substantial quantities of oil and oily emulsion and sludge could have flowed out with the effluent, the Commission now proceeds to find out whether it was *probable* that such large quantities of oil as estimated were discharged by the refinery. For this purpose, the Commission has to consider the following:

(a) Quantity of slop oil generated in the refinery.

(b) Available methods of utilisation of slop oil and space for its storage.

(c) Probable reasons for large quantities of slop oil entering the Guard Basin 1.

(a) *Quantity of slop oil generated in the refinery:*

(a-1): *Generation and recovery of slops*—It was earlier explained in Chapter XII, that the slop oil in the Barauni Refinery originates from two main sources, namely; from the circulating condenser water and from leakages in pumps, valves and fittings and accidental spillages in various process units. The oil from the circulating condenser water is separated in the oil separators of sector 7 and the oil from leakages and spillages in process units are separated in sector 6. Normally, all the oil separated from the circulating condenser water and the effluent water should be termed as slop oil "recovered" for the reason that oily product, being a valuable material, would not be wasted when once it is separated out from the water streams. Shri Y. D. Puri (E.R. P. 1023, 1024) and S. G. Hyder (E.R. P. 454) however stated that the term "slops recovered" is used in the refinery to mean only those slops which are pumped into the separating tanks N-1 to N-4. For all other slops which are stored, in the emergency basins, oil separator sections and other units, there is no proper term to identify them. They are not considered as "recovered" even if they are separated from most of the water and temporarily stored in the units. This terminology creates some confusion as shown by the fact that in a statement of the refinery (BRD 24) on through-

put and production for the period 15th February to 1st March, 1968, the slops "recovered" were stated to be "nil" on 11 days. This cannot be true because, as explained by Shri Hyder CW 4 (E.R. p. 432), separation of oil normally takes place continuously in the oil separators and the skimming of oil and its pumping also proceed continuously. Thus the oil that has been separated out from the water streams and transferred, whether by pumping or by gravity flow, into any unit should be deemed as "recovered" and stored. Shri Hyder also said at P. 424-E.R. that the term "recovered" is used only with reference to tanks N-1 to N-4 because the dips taken in these tanks only are used for purposes of accounting the quantities recovered and to be processed. Thus, all the slop oil lying in all the other units does not enter the slop account at all. This is an unsatisfactory accounting method and gives a false picture of the position as shown by the fact that according to the refinery statement BRD 58, during October, 1967, to February, 1968, slops "recovered" were 12,019 tonnes and slops "processed" were 12,361 tonnes; obviously some of the previous stock has been processed. Also, if the slops "recovered" included all that was "generated" in the refinery during these five months, all of it has been processed and there ought to be no problem at all in regard to processing of slops about which Shri Tuli complained in his note (BRD 29) and the Shift Foreman OM&SR have complained (BRD-5F) in connection with findings of space for storing slops. The Commission therefore prefers to use the term slops "generated" to indicate a true account of the slop oil separated from all the water and effluent streams in sectors 6 and 7.

With this background, the Commission now proceeds to assess the quantity of slop generated during October, 1967 to February, 1968. In the opinion of the Commission, it would not be necessary to calculate the slops generated prior to October, 1967, for the reason that even if any of the unutilised slop oil escaped with the effluent, it would have got dispersed in the much larger volume of river water which must have been flowing into the effluent channel upto September, 1967. It is only after October, 1967, that the dry season must have started, gradually reducing the flow of river water into the channel. The data for the period upto end of September, 1967, are, therefore, not relevant for the purpose of establishing the cause of contamination at Monghyr in March, 1968.

The calculation of the quantity of slops generated would have been facilitated if the correct dips of slop oil stored or separated in each unit had been recorded by the refinery. The Commission regrets to note that although several sections in the oil separators (O.S.) of sector 7 and the Silt Accumulator (S.A.) of sector 6 were used regularly over several months to store slop oil, no record of the dips in these units has ever been maintained. In the absence of this direct information the Commission has to calculate the quantity of slop generated using the test data on oil contents of the various streams carrying slops and the quantities of the total streams entering various units. Estimates are thus made separately for Sectors 6 and 7. However, before proceeding with the calculations, it is necessary to establish the reliability of the test data on oil contents.

(a-2) *Reliability of test data on oil contents*— The reliability of analytical data on oil content of water depends very much on the method and care taken in collection of sample. Technical literature lays great emphasis on adoption of proper sampling techniques.

The refinery authorities supplied analytical data on oil contents of various water and effluent streams during 67 and 68. Normally, the refinery operators and other personnel collecting samples are expected to be well trained in sample collection. The earlier discussion on reliability of sampling of effluent from Guard Basin sections showed that sampling has been unsatisfactory prior to the incident. Therefore, even after giving the due consideration to the normal human errors, the reliability of the sample would depend upon the sincerity of the collector, and the difficulties posed by the location of sampling point and the quantity and nature of the stream. It would be reasonable to state that sampling from an open channel which is easily accessible to the operator and well ventilated and illuminated, would be more easy and reliable than sampling from a rapid current flowing in a deeply laid pipeline, done through a deep dark manhole full of fumes. Thus the sand trap and water circulation systems would fall under the more easy category and the manholes at the end of the guard basins in the more difficult category.

The refinery personnel have been doing their duties in the normal course. There is therefore no reason to pick and choose the test data for assessing their reliability. The location of the sampling point and the facilities available for sampling should, therefore, be the main criteria in judging the reliability of the samples.

Since the refinery analysis and supervisors are well trained personnel there is no reason to doubt the result and their ability to determine oil content in a given sample, unless wrong values are deliberately reported.

Based on these criteria, the data on oil contents of effluent entering sand trap and recirculating water systems should be considered fairly reliable, subject to normal human errors. Those from effluent line manholes immediately after G.B.I. could be subject to more serious and frequent errors.

Between the sand trap and the oil separators, there is another difference which affects the reliability of the samples. The sand trap is a much narrower unit than the oil separator sections. A sample collected from a smaller or narrower unit or cross-section is likely to be more uniform and reliable than that from a wider cross-section, particularly when the person can see the liquid stream from which he is sampling and can operate the equipment better. Further, according to the functioning of the units, all the oily effluent entering sector 6 first enters the weir and then most of the water with some oil enters the sand trap. After the sand trap, the stream goes directly to the oil separators. In the separators, due to reduction in velocity, oil floats and if there is emulsion, it stays between oil and water. If the emulsion is stable and does not separate some of it can flow with water and the mixture is not uniform. Under these conditions, if the operator collects one sample from one point out of the whole cross section of flow, there can be serious errors in the sample collected from the oil separator outlet.

It therefore appears that the sand trap sample, presumably collected after the trap and before entering the oil separator is more reliable and the oil separator outlet and Guard Basin effluent samples, less reliable.

(a-3) *Calculation of slop oil generation—Sector* 6—The slop oil generated in a unit is the difference between the quatities of oil entering and leaving a unit minus the losses, if any. Thus, if the flow rates and oil concentrations of the inlet and outlet streams of a unit are known the oil generated in the unit can be calculated. The oil content is known from the test data on samples taken from different points of the effluent stream entering various units. These data are not available for every day or shift but for periodical samples. Oil content of influent to sand trap and effluent of Sector 6 oil separators are recorded (BRD 6, 14, 15) on only one day during June—August, 1967, 2 days in September, one day in October, 4 days in November and 5 days in December, 1967, 5 days in January, 1968, and 7 days in February, 1968.

While this frequency is quite low, it definitely indicates that the supervisors found the necessary for more frequent tests over certain periods and particularly in December, 1967, and January-February, 1968.

(i) *Sand Trap and Oil Separators*—All the oily effluent to Sector 6 enters the weir just before the sand trap (S.T.). At the weir, part of the excess oil is diverted into the emergency Basin No. 1 (E.B.) and the remaining oil and most of the water enter the S.T. The oil going into the E.B. will be considered later. Regarding the S.T., there is no specific mention anywhere of the design limit of oil content in the effluent entering this unit. But all the oil in the effluent entering sand trap must enter oil Separator (O.S.) sections, because there is no other diversion nor separation of the oil from effluent water at this unit; all separation is done only in the O.S. sections. So the design limit of oil content in effluent entering S.T. must be the same as that of the entry to the O.S. which is 5000 mg/l (0.5%).

The actual analysis of water entering the sand trap during the period September, 1967—February, 1968, (180 days) (BRD 14, 15, 6) has been reported on only 23 days and has never been less than 1.5 per cent and varied between 1.5 per cent and 10.2 per cent, that is, 3 to 20 times the design limit. During December, 1967—February, 1968 it varied between 1.8 per cent and 8.8 per cent (i.e.) about 4—17 times the design limit.

Regarding the effluent flow rate, no separate design figure was given for the S.T. since all effluent entering S.T. also enters the O.S. sections, the design flow rates for the O.S. are used for calculation.

Quantity of slop oil from Sand Trap and oil separators (Sector 6):

A. Designed Loading:

Total effluent flow rate is 600 m³/hr

Oil *entering* as per design (0·5% =5000 ppm): 600×5×24 kg/day= 72 tonnes/day= 80 cu.m/day

Oil *leaving* as per design (150 ppm max.) : 600×24×0·15 kg/day=2·16 tonnes/day=2·4 cu.m/day

Therefore, oil separated out is about *70 tonnes per day* (78 cu.m/day)

B. Over/-Loading of oil Separators :

(a) *Inlet oil content* :(as found in Sand Trap effluent) (BRD : 6,14,15)

min.	max.
2%=20,000 ppm	9%=90,000 ppm

Oil entering per day for both sections:

600×24×20 kg/day=288 tonnes/. 1296 tonnes/day=320cu.m/day

600×24×90kg/day= =day 1435 cu.m/day

(b) *out let oil content*

(i) *design value assumed*: 150ppm max. (i.e.) A very efficient separation)

quantity of oil leaving separators : 600×24×0·15 kg/day =2·16 tonnes/day=2·4 m³/day

Hence slop recovered :

(*i*) *with minimum inlet oil content* (2%) : 230—2·4= 317·6 cum./day=nearly *286* tonnes/day

(ii) *with maximum inlet oil content* (9%) : 1435—2·4= 1432·6 cum/day=nearly *1294* tonnes/day

This means that if the separators operate so efficiently as to maintain the maximum permissible outlet oil content despite high inlet concentrations, the slops generated would be 4—18 times the design figure. The separators would thus be very much overloaded.

(2) *Assume same separation as under design conditions:*

Quantity of oil separating out: 78 cu.m/day = 70 tonnes/day.

Then the unseparated oil must leave with the effluent and the concentration of oil in effluent leaving separators would be:

With minimum inlet oil content (2%): 288 — 70 = 218 tonnes/day = 15,000 ppm.

With maximum inlet oil content (9%): 1296 — 70 = 1226 tonnes/day = 85,000 ppm.

These concentrations would be atleast 100 to 600 times more than the permissible limit at the entry to the G.B., which would mean overloading of the G.B.

This quantity of separated oil (78 cu.m) under design conditions from Sector 6 O.S., represents pure oil. If the skimmings contain 50 per cent water as per design, the total volume is double—156 cu.m/day which goes to oil settling tanks.

(3) If the separation is of intermediate efficiency, the oil concentration in the O.S. effluent would always be higher than the permissible design value.

To avoid risk of oil going into Guard Basin, the skimmer pipe should be so turned as to admit more water with oil. If it is intended to avoid too much water with oil so as to reduce emulsification during pumping and difficulties and delay of separation in N1—N4, the operator turns the skimmer slot more upwards. This would normally result in build up of oil layer in O.S. sections. But it could also lead to part of the oil escaping with the water due to turbulance at the discharge end, particularly when separation of oil is poor due to bad quality of slops and low temperatures.

The above calculations refer to design figures; but the refinery was not working to full design capacity. Even then the effluent pumps were working full time. So Sector 6 O.S. must have been working at design loading of water which could be due to too much water leaking out of glands and too much of purge water from the 1st circulation system.

Test data during September, 1967—February, 1968 generally show that the effluent at oil separator outlet contains 50—90 ppm. except on one or two occasions when it was very high. It was explained earlier that the reliability of the sample at the oil separator outlet was less than that at the Sand Trap.

There is another likelihood of doubt on the test data. The data on samples are collected once a day, mostly during the morning shift when operators can clearly see and take precautions if they realise the significance of sampling procedures. One sample a day does not truly reflect the separator conditions. It is very likely that conditions in the night shift were not properly controlled and adequate vigilance might not have been kept, resulting in excessive oil going to Guard Basin 1.

If effluent from oil separator was really containing 50—90 ppm. oil content (as reported in the test data) which is quite low, and assuming the overloading of Guard Basin 1 as shown in earlier discussion, how could the latter take place? This can be possible only when the water drains from settling tanks and other storage areas (water drain from emergency basins, water from silt accumulator etc.) are heavily contaminated with oil and sludge and are indiscriminately pumped into Guard Basin through job 525 which is the pumping station for industrial and storm water sewage.

Thus it can be stated that the oil contents of effluent entering S.T. show with fair consistency, very high values compared to design figures. Although there can be errors here and there, the consistency high values whose reliability was discussed earlier, indicate poor operating and maintenance practices in the units wherefrom the industrial drains originate. If this is considered alongwith the consistent reports on leakages in pump glands in the AVU units, particularly during January and February, 1968 (BRD 11 and 12), it clearly establishes the probability of heavy leakages of oil through pump gland cooling water, as an important cause of high slop inventory.

(ii) *Emergency Basin No. 1 (E.B.)*: As explained earlier, part of the oil with some water constantly overflows the weir and accumulates in the E.B. No. 1 which has two sections. This is therefore an important unit where the first accumulation of slop oil takes place in sector 6 and if dips are regularly maintained, calculation of slop oil accumulating here would be possible. Regretably, due to the fact that this unit is the subject of the organisational controversy between the O.M. & S.R. and water and Effluent divisions, oil dips were not regularly noted. Shri Hyder CW 4, stated in his evidence (E.R. p. 429) that no dips are noted whenever the E.B. 1 is with the water and Effluent division. Shri B. D. Gupta, CW 2, of the Water and Effluent Division confirmed this by stating that the E.B. are normally under his division. (E.R. p. 186-187; BRD 2, p. 27 and 56 (a) and that responsibility of effluent oil dips lies with the O.M. & S.R. Division (E.R. p. 265; p. 164; p. 171).

During 1967, oil dips were noted during Jan—July, 1967 (BRD-49 and 52); in August, no dips were noted between 7th and 31st; in September,

dips were noted on most days. In October and November no dips were noted at all. During December, no dips were noted except on one day for section I of E.B. 1; for section II, no dips till the 26th. In Jan. 68, for section I, no dips at all were noted; for section II, dips were noted. In Feb. 1968, no dips were noted in both the sections from 6th to 25th. This means that during the period October, 1967—February, 1968, for most part, the E.B.I. sections were under the W&E divisions, although they were being used by the O.M. & S.R. division to transfer slop oil whenever possible. Thus no regular and proper record is available of the total quantity of the slop oil accumulating in the E.B. 1 and it is therefore not possible to calculate or assess the quantity of slop oil generated here by diversion from the weir. However, when the Commission inspected the refinery, the members saw a major proportion of the oil entering the weir was overflowing towards the E.B. 1. The refinery authorities explained, on enquiry from the members, that normally a larger part of the oil flows into the E.B. 1 and a smaller part flows into the S.T. and the O.S. If this is true and if the quantities of slop oil generated in the O.S. as calculated earlier is considered, then the quantity accumulating in the E.B. 1, should be more than that separating in the O.S., because both these operations are continuous and simultaneous. It is, however, to be noted that the proportion of slop diverted to the E.B. can be varied at the weir depending upon availability of space. It is thus likely that if, for any reason, the E.B. 1, sections are full, all the oil would be sent only to the S.T. and O.S. in which case the slop generated in Sector 6 would only be what is separated out in the O.S. sections.

It is therefore concluded that no reliable estimate of the slop accumulating in the E.B. 1 during October, 67—February, 68 is possible.

(iii) *Silt Accumulator (S.A.)*: The S.A. is not a unit where any separation of oil from effluent takes place. Thus there is no slop generation here.

(*a*-4) *Slop oil generation: Sector 7 Oil Separators: Loading for oil separation as per design*:

(i) *First system recirculation water*:

Quantity: 302,088 cu.m/day

Oil entering @ 100 ppm = 302088 × 0.1 kg/d = 30.2 tonnes/day (33.6 cu.m).

Outlet oil content is assumed zero, in the absence of any figure. Hence all this oil will be separated out.

(ii) *Third system water*:

Quantity: 19,728 cu.m/day.

Oil entering @ 7000 ppm = 19728 × 7 kg/d = 138.0 tonnes/day (153.2 cu.m).

Outlet oil assumed zero; hence all this oil will be separated.

Apart from the industrial and storm water drains entering sector 6, the other source of slop oil entering the oil pumping station (Job 532) is the oil separator system in sector 7 where oil carried by the recirculating cooling water is separated. The oil to be separated in this system as per design is calculated above.

The oil recovered in Sector 7 can be high for two reasons: —

(a) the quantity of cooling water used in units can be high, resulting in higher total oil content;

(b) the concentration of oil in the circulating water can be high, resulting again in high oil generation.

Both these reasons can co-exist, which would further increase the oil generation.

The cooling water requirement increases when the condensers and coolers are fouled reducing their cooling capacity and also when the heat-exchangers preceding coolers do not function properly for any reason. These difficulties can frequently arise in a refinery and good maintenance practices are the only guarantee against deterioration of cooler and heat-exchanger performance. The log-books (BRD 6 and 34) for water supply, show that during 1967 and till February, 1968, the total cooling water consumption was well below the design figure of 12,600 cu.m. per hour, except in June, 1967. During September, 1967, to February, 1968, the total consumption was about 25 per cent less than the design limit. But, the water consumption for AVU II which was restarted on 21st February, 1968, remained well above the design figure by about 16 per cent during 26th February, till 5th March, 1968. The Executive Engineer, Shri B. D. Gupta, noted and complained about this in the log-book (BRD 34). Still, AVU I was consuming less than the design quantity; K T U I and coking unit were consuming slightly higher than the design quantity on many days in February, 1968. The total quantity still remained within design limit because many other units were not or only partly operating. All this refers to the 1st circulation system. The third circulation system was always below the design limit.

Thus, the total quantity of cooling water cannot be considered to have contributed to increased slop oil generation in Sector 7.

The oil content of recirculating water, however, appeared to have exceeded the design limit on many days although data is scanty. On 7th December, 1967, oil content was as high as 14.9 per cent. which can only happen when coolers develop profuse leakage. High oil content was recorded on 6th and 8-12-67, 24-9-67 and 3-1-68 (BRD 14 & 15). On 5th, 8th and 27th February 1968, notings were made in BRD 34 that too much oil is found in the first system circulating water from AVU II. Log-Book No. 2 for water supply, has notings of too much oil in first system water from AVU I and II, on 27th and 28th January, 1968. Collection of circulation water samples and their analysis do not appear to have been regularly done. It is fairly clear that during December, 67—February, 68, oil content of the circulation water was very high on many occasions if not all the time.

It is however, not possible to calculate precisely the excess slops that might have been produced in sector 7. Assuming about 1 per cent of oil content in the 1st system recirculation water and reducing the total water in circulation by about 25 per cent, the oil separating in sector 7 during the period December, 67, to February, 68 would have been about 2,270 tonnes/day. This appears to be an unlikely quantity. Assuming oil concentration of 0.1 percent, the quantity would be about 227 tonnes/day or about 250 cu. metres/day. Even the latter figure is about 7 times the design quantity. Oil from 3rd circulation water which was small, would be additional.

The Refinery authorities have stated that they do not have the practice of taking oil dips in the oil separator sections in Sector 7. Such data would have indicated the quantities of slops generated in sector 7. According to the operation, normally the oil separated in sector 7 is sent to the oil pumping station in sector 6 (Job 532) from where the sector 6 operators of the O.M. & S. pump the oil into tanks N1 to N4 or other storage units depending upon availability of space.

The Commission noted during their inspection that the oil separating units in sector 7 contained considerable emulsion and sludge. Such oil when sent to the settling is likely to delay separation, thereby ultimately reducing availability of space for slop oil transfer in a given time.

(*a*-5) *Total quantity of slop oil generated*: From the foregoing calculation, the total quantity of slop oil generated during the period Oct. 67—Feb. 68 under the operational and maintenance conditions actually prevailing in the refinery, can be summarised as below:

	Minimum overloading (tonnes)	Maximum overloading (tonnes)
Sector 6 : oil concentration:	(20,000) ppm	(90,000) ppm
Daily production rate (Pd)	286	1294
Total production during Oct, 67-Feb, 68 (Pd × 150 = Pt)	42,900	1,94,100
Sector 7 : Oil concentration	(500) ppm	(1,000) ppm
From only first system circulating water, quantity being 25% less than the design limit ;		
Production per day (Pd) ..	113·3	226·6
Production during Oct '67-Feb' 68 (Pd × 150 = Pt)	17,000	33,990
Total production during Oct 67-Feb '68 (Tonnes) ..		228,090

The following conclusions may be drawn on these estimates:

(a) The total estimate with maximum loading appears extremely high and unrealistic because this assumes that the maximum oil concentration assumed in the calculation was prevailing throughout the period which was obviously impossible. This estimate may therefore be ignored.

(b) The estimate with minimum loading may be on the low side because much higher oil concentrations than assumed here were noticed on many days.

(c) It is not necessary that the minimum overloading in Sector 6 has always coincided with the minimum overloading in Sector 7. If, on many days, the minimum overloading in one Sector coincided with maximum overloading in another sector, the total estimate falls within the limits of 59,900 tonnes and 211,100 tonnes.

Considering only the figures for Sector 6, it is reasonable to estimate that the total quantity of slops generated during the period was between 43,000 and 120,000 tonnes, the latter being an average of the limits.

(b) *Available methods of utilisation of slop oil and space for its storage*:

(b-1) *Methods of utilisation*: The only methods of utilisation of the slop oil adopted in

the refinery till the incident was to process it along with the crude oil in the A.V. units. Due to the quality of the slop oil and operational difficulties, the quantity of slop oil processed in the A.V.Us. was very small. During the period October 67—February 68, the total quantity of slop processed was 12,361 tonnes along with 710,407 tonnes of crude oil (BRD-58). The slop oil is thus 1.74 per cent on the crude. The quantity of slop processed during the three months December 67 and January and February 68 was 1.8 per cent on crude and in February, it was 2.2 per cent. The quantity of slop generated during the five months was, as estimated earlier, a minimum of 43,000 tonnes which is about 6.0 per cent on the crude processed during same period; the upper limiting quantity of 120,000 tonnes would be 18 per cent on crude.

The question now is whether the refinery had the facilities to process all the slops that were estimated to have been generated (both maximum and minimum limits), assuming that the slops were actually separated out from the water and effluent streams. The notes of Shri Tuli (BRD-28 and 29) have clearly stated that there was need for increasing the quantity of slop to be processed, in order to reduce slop inventory and unsatisfactory conditions in sector 6. The Shift Foreman have made entries (BRD-5F; BRD 45 E, 18.1.68, 3.2.68, 8.2.68, 9.2.68) to the effect that unless slops are processed in larger quantities by the A.V.Us the problem of space from slops in sector 6 cannot be solved and that the A.V.Us. have been resisting to process larger quantities of slops because of operational problems. Shri Puri CW II, on the other hand, when questioned on the subject replied (E.R.P. 995) that no percentage of slop processing was fixed, and even upto 15—20 per cent slops can be processed, if there is no upset in the AVU due to water. Obviously, this reply of Shri Puri was not factual, for, if theoretically, the AVUs could process upto 15—20 per cent slops, then the very fact that they could not actually do it indicates either non-cooperation of AVU staff or that the quality of slops was too bad to be acceptable. In reply to a specific question, Shri Puri replied that except water there is no question of poor quality or good quality and later he admitted that production of LPG may be affected due to slop (E.R. p. 996). To questions on influence of high percentage of coker products in the slops on the product specifications, he avoided giving straight replies (E.R. p. 996-997). The Commission, after considering the material placed before them and after seeing during inspection the type of slop accumulating in sectors 6 and 7, is of the opinion that the quality of the slops generated in the refinery was unsatisfactory and that there was genuine difficulty in processing it in the AVUs due to disturbance to the column and lowering of the quality of the products. It should, therefore, be concluded that the only method being used in the refinery upto the incident for utilising the slops was not adequate to treat the type of slops that were being generated.

The Commission were informed during inspection and discussions that after the incident the refinery made successful attempts to process the slops in the coking unit and that they could not do this earlier due to operational difficulties. In the opinion of the Commission, the important basic question to be answered was not how much of the dirty slops could be processed by a particular method, although this assumes importance as an expediency at a particular time, but rather how to reduce generation of slop oils and how to control the quality of the slops, isolate unsatisfactory slop oils and prevent them from deteriorating the other slop oils. During its discussions with technical experts of other refineries which the Commission visited, the Commission was told hy all of them that an important step in the recovery of slops is to quickly identify the source of each type of oil entering the effluent and to isolate it, if considered undesirable. In fact, in one refinery which the Commission visited each process unit has a small attached slop oil separator and that refinery claimed this to be a good safeguard against mixing of undesirable slops. Other refineries, though not having individual unit oil separators, were not facing a prohlem of disposal of slops because of their successful quality control.

The Commission is, therefore, of the opinion that the Barauni Refinery could not adequately process the slop oils because of the poor quality of the slops and of the excessive quantities being generated.

(*b*-2) *space available for storage of slop oils*: The important facilities preceding Guard Basin 1, for slop recovery and storage, according to the design are: the three sectioned oil separator (Job 523); the two tanks of emergency basin No. 1 (Job 524); the four slop tanks (N1 to N4; Job 534); the industrial effluent pump pit (Job 525); and the slop oil pump pit (Job 532).

The other unit in sector 6 is the silt Accumulator (Job 535) which, according to the design (R-1, Refinery Memorandum, p. 39-40) should be used for storing silt and sludge removed mainly from oil separators in Sectors 6 & 7 and also from other units. It is not normally intended to be used for storing oil except in an emergency when oil can be stored at any convenient place for the purpose of avoiding a crisis or hazard. Prior to the incident under refinery, the silt accumulators have played a key role which will be discussed later.

The dimensions of the various receiving units in sectors 6 and 7 where oil can be stored when necessary, are given in table 3, which also contains data on the quantities of oil that can be held in each unit.

(*b*-3) *Slop Account*: The only way to check whether the refinery had adequate space to store the slop oils being generated and whether it

could possibly have discharged large quantities of slops along with the effluent into the effluent channel is to calculate the likely total slop production during the given period and deduct from it the sum of the quantity processed during the period and the quantity stored in all possible units. The remaining quantity should then be compared with the estimated accumulation at Monghyr and on the river upto the effluent channel. This calculation is shown below:—

TABLE 3—DIMENSIONS OF OIL SEPARATING AND RECEIVING UNITS

Name of Unit	l m.	b m.	h m.	d m.	A sq.m.	Vmax cu. m.
A. *Sector 6*						
1. Guard Basin 1 (3 sections) Per section—						
Top	140	35				
Bottom	128	23	app. 2·52		app. 3,300	app. 8,300
2. Oil Separators (3 sections):						
Per section—app. ..	30	6	app. 2·2	..	180	400
3. Emergency Basin 1 (2 sections):—						
Per section	..	..	max. 2·5	30	707	max. 1,768 (1100 effective normally)
4. Skimmed oil pumping pit ..	..	..	2·5	6	28·3	71
5. Settling tanks N1—N4; per tank	..	..	app. 7·0	8·5	57	400
B. Settled Slop Tanks (Nos. 11 & 12)	..	..	12·2	22·8	410	5,000
C. *Sector 7*						
Oil Separator Sections (22 Nos.)	(Dimensions of each section same as 2 above).					

NOTE—

l=length; b=breadth; h=height; d=diameter; A=surface area; Vmax=Volume at maximum depth.

1. *Likely accumulation at Monghyr and upto the effluent outfall*: Total estimated quantity of oily matter found accumulated at Monghyr, floating on the river Ganga and present in the channel upto the effluent outfall was 5500 tonnes, excluding the oily matter that has seeped into and soaked the sandy banks of the channel.

2. *Likely slops generation during Oct. '67—Feb. '68*: The quantities estimated earlier are summarised below:

	Min. overloading (tonnes)	Max. overloading (tonnes)
Sector 6 (excluding accumulation in Emergency Basin 1 Sections)	42,900	194,100
Sector 7 (only for the 1st circulating water system)	170	33,990
Total ..	43,070	238,090

NET REALISTIC ESTIMATE:

Lower limit: 43,000 tonnes

Average upper limit: 120,000 tonnes

3. *Consumption and stock*:

	(in tonnes)
(*a*) Quantity processed in AVU's during 5 months (BRD 58)	12,361
(Quantity recovered ex-skimmed oil tanks N1-N4: 12290 tonnes)	
(*b*) *Hold-up in all possible units*:	
(1) Max. quantity that can be stored in two sections of emergency basin	3,182
(2) Max. quantity what can be stored in O.S. (sector 6), 3 sections, all full:	1,080
(3) Maximum quantity that can be stored in S. A. 3800M³ : (assuming no silt at all)	3420
(4) Maximum quantity in all tanks N1—N4	1440
(5) Oil pit, full of oil	64
(6) Slop Tanks Nos. 11 and 12	9000
Total ..	18186
Total possible stock filling all available units in Sector 6 + quantity processed over five months (as pure oil without water) ..	30547
Slop oil separated during five months with minimum over-loading as in 2 above :..	43000
Unaccounted slop : (over five months) ..	12453

The above account shows that starting with all empty units on 1st October, 1967, after conducting the usual operations and after filling all the units at the end of February 1968, there is still over 12,000 tonnes to be accounted for, from sector 6 above.

There is no other space in the refinery where this can go or be stored, if the oil has at all been separated as efficiently as assumed. Guard Basin sections cannot be assumed to be storage places for oil unless it is accepted that excessive quantities of oil would have passed out with oil effluent because Shri Puri, CW 11, admitted (ER, p. 1112-1113) that no oil ca nbe pumpsed into the Guard Basin Sections. Also, it is impossible to fill the different units in sector 6 with slop oil as assumed above (for example, silt accumulator, oil separator, etc.) even taking a liberal view of the operations. In fact, the dip statements (BRD 49, 52) show that the O.S. and the E.B. 1 sections have not been filled to the brim. The stock would then further reduce, and the unaccounted gap further increase. So, if the oil has been separated, where was it kept?

The only answer to this puzzling question can be found in the likelihood of oil not having been separated from O.S. as efficiently as was assumed. The sampling at the O.S. outlet must have been very erroneous and inadequate to give a correct idea. Indeed, the most probable and the only answer is that most of the oil entering the sand trap and the oil separators must have gone into the guard basin sections and from there due to excessive overloading and inefficient separation, must have been regularly going out into the effluent going to Ganges. It is likely that most of the time the oil was going out as emulsion which the operators might not have noticed. Whenever the oil flowed out as a free layer or a slug, the operators might have noticed and recorded their observations.

(*b*-4) *Check calculation on Guard Basin*: The refinery engineers Shri Gupta, Shri Puri, and Shri Hyder have stated in reply to questions put to them during examination, that the Guard Basin sections can be used for accumulation and storage of slop oil in emergencies. Although this is bad operational practice, an estimate is made of the quantity that can normally be held in all the three sections, assuming that two sections are in operation and one is just holding oil. In each section, the volume is 3300 m^3 for 1 m depth. Assuming 0.5 m as an average constant depth of the oil layer, each section holds 1650 cu.m; assuming that two sections hold 0.5 m depth of oil and the third has 1 m depth, the total quantity of oil would be 6600 cu.m., equal to about 5940 tonnes, still unaccounted and which must have gone out of G.B. = 5940 tonnes.

This compares well with the maximum estimated accumulation at Monghyr and on the river and channel waters.

It must be noted that in all these calculations on available space, a liberal view of the operations has been taken and full consideration has been given to the version of the refinery engineers regarding facilities for slop storage and dips in various units.

If about 12,000 tonnes have gone out into the effluent channel, much of it would have seeped into the sandy bed and banks, particularly under fluctuating temperature conditions. What remained above must have ultimately found its way down the river.

(*b*-5) *Storage space in sector* 7: There are 22 sections in the oil separators of sector 7. Shri B. D. Gupta, C.W. 2, stated (E.R. p. 186, 187) that the oil separated in sector 7 can be stored in sector 7 O.S. sections themselves and that its transfer to sector 6 can be avoided whenever there was emergency for space to store slop oil in sector 6. It appears that this was not implemented in practice and skimming from sector 7 to sector 6 was going on regularly as shown by the fact that the E.B.I. sections were under the control of the Water & Effluent Division from 5.2.68 to 25.2.68 and also by the entries in log-books (B.R.D. 5, 6-2-68, 1st shift, 8-2-68, 1st shift, 16-2-68, night shift, 17-2-68, 2nd shift). On the other hand, slop oil from sector 6 cannot, in anyway and at any time be transferred in the reverse direction to sector 7 O.S. sections, even if space is available in sector 7. It is thus clear that the availability of space in sector 7 has not been of any help in actual practice to relieve the emergent conditions in sector 6.

Further, it has to be seen whether in fact sector 7 had any space available to store the slop oil generated there. As discussed earlier, the oil content of circulating water was quite high on many occasions during December, 67 and Jan. and Feb. 1968 (BRD 34). On 5th, 8th, 27th and 29th Feb. 68, there were specific notings in this regard in BRD-34. In view of the high oil contents reported (BRD 14, 15, 34) assuming 100 tonnes per day of oil separated from circulation water for 3 months, the quantity of oil would be 9000 tonnes. In view of the absence of space in sector 6, as shown earlier, if all this oil has to be stored in sector 7 itself, it would require all the 22 sections to be completely filled, which is an impossibility. Assuming the design figures, the quantity over 3 months would be about 2700 tonnes or about 3250 cu.m. Since each separator sector, when filled completely, can hold 400 cu.m. of liquid, it would need complete filling of 8 sections and more if filled to lesser capacity. This assumes that oil is easily separated. If the separation is poor, the purge water with oil emulsion can go to the effluent pump pit, job 525, from where the liquid has to be pumped to the guard basin sections.

Thus considering all the material placed before it, the commission has no hesitation in holding that oil from sector 7 has been transferred to sector 6 which was already overloaded, that the slop oil generation in sector 7 was excessive during Dec. 67 to Feb. 68 and that there was every likelihood of oil water emulsion having been pumped via Job 525 into the guard basin sections which must have overloaded them.

(c) *Probable reasons for large quantities of slop oil entering the Guard Basin* 1 *and leaving it*:

From the foregoing discussion it is quite clear that storage space in sector 6 was totally inadequate, if all the slop oil entering sector 6 was really separated and had to be stored. Thus the only conclusion that can be drawn is that so much of slop oil as was calculated was in fact *not separated* although it was entering the separators in sector 6, and that therefore much of the oil must have entered the guard basin. Also, for reasons of poor operation and maintenance of the G.B. 1 sections already explained earlier, most of the oil must have been going out regularly with the effluent into the Ganga. It was likely that most of the time oil might have been going out of the G.B. siphon as emulsions and occasionally as slugs of oil itself . which were observed by operators.

The possibilities of more than the designed limits of oil going into the G.B. 1 sections will now be considered. Oil can enter the G.B. sections in two ways: either through the effluent from the O.S. sections of sector 6 or through the purge water from sector 7 coming to Job 525 via the coke cutting unit.

(*c*-1) *Oil separator sections of sector* 6: The designs of the Oil Separators appear normal. The units are similar to the usual oil-water separators, although the design is not exactly the same as of the examples recommended in the API Manual for Disposal of Refinery Wastes, Vol. I. There is no reason why the oil separators at the Barauni Refinery should not function satisfactorily if design operating conditions are maintained.

The efficiency of oil separation and slop recovery would depend apart from the oil content of the influent and the loading of the separators, on how efficiently they are operated and maintained. The factors that affect the separation efficiency apart from loading are:

(1) quality of oil entering with the influent to separators;

(2) removal of silt and sludge from the separation units and storage facilities.

The quality of final slop oil depends upon the qualities of the oil streams entering the effluent drain, the period of storage and the contaminants in the streams. Cracked and heavy products, particularly when stored, have a greater tendency to formation of stable emulsions than clean and lighter products. No records were available giving data on the relative proportions of different products in the final slop. However, the frequent entries in log books of the presence of emulsion and sludge in the Guard basins and the claim of solidification of the slop due to presence of waxy material and the high pour points of samples examined show that the slop oil mostly contained heavy fractions with a high wax content. Such slop usually poses greater difficulties in separation.

Records show that periodical cleaning of separator sections and removal of sludge and silt to silt accumulator has been done. It is not possible to say whether this was adequate. It is however significant that sections of emergency basin 1 and effluent water pumping station (Job-525) are reported to have contained coke sludge which must have been pumped to the G.B., whose efficiency is thereby reduced (Shri Hyder, E.R. p. 464; BRD 1, 8-2-68, 1st shift, BRD-5F).

(*c*-2) *Skimmed oil settlers*: Four slop settling tanks (N1—N4) are provided, each with 400 m^3 designed filling capacity. The slop oil is assumed to have 50 per cent water and each tank is designed for 3 days settling time. Thus, the pure oil content in each full tank would be 200 m^3 and each tank would be available for refilling only after more than 3 days, providing for draining of water and pumping out oil.

If the separation of emulsion becomes difficult and if there is too much slop oil accumulating in separators and other units, the operator would tend to drain out the partially separated emulsion which would then go from N-1/N-4 via the industrial drain into the weir where it would normally flow out into the emergency basins. From this point the water and unseparated emulsion layer can be pumped only into the Guard Basin.

(*c*-3) *Emergency Basin* 1: Shri B. D. Gupta, in his evidence (p. 186—199) Shri Hyder at pages 429, 431 and 517 (E.R.) and Shri Puri at pages 984 and 1024 have stated in reply to questions put to them that the emergency basin 1 has plenty of space and it can be filled upto 3 m. height from the bottom and that the basin was being regularly used to store oil skimmed from oil separators and Guard Basin. The Memorandum of the refinery states however (para. 40: page 38) that the "emergency basin is intended to hold the oil products entering the sewerage system in case of emergency at the refinery intermediate tankages as well as for temporary accumulation of storm water". The very fact that the refinery found it necessary to regularly use the emergency basin 1 for more than one year for receiving slop oil from the weir and to store slop skimmed from other units, without having to meet any emergency in the intermediate tankages, should be considered adequate proof of the large slop inventory which must have necessitated the regular use of emergency basin 1. It was further stated in the same para. "In case the oil is allowed to stay for longer duration in this (*i.e.* the E.B.) some of the oil may leak into the pump pit in the industrial and storm water pump house from the sluice gate which is further pumped on to guard basin No. 1". Despite this warning, the E.B. sections have been used

regularly for storing large quantities of oil and sometimes with mud and emulsions. There is, therefore, a clear possibility that there has been regular and substantial leakage of oil, mud and emulsion into the industrial and storm water pumping pit (Job No. 525) wherefrom the effluent was continuously being pumped into the G.B. 1 sections. This effluent would have had substantial quantities of oil. It was further stated in that para. that "dips of oil in the E.B. alongwith the oil separators and the Guard Basins are regularly taken in each and every shift". Despite this stipulation, the Commission has found, as stated earlier while discussing the calculation of quantity of slop generated, that for many months no dips were noted for E.B. 1 when they were being used by Water and Effluent division; there was no evidence to believe that the basins were kept empty. It is thus clear that the E.B. 1 has been used as a regular run-down tank for slop, providing a source of ultimate supply of oil to the Guard Basin 1. The Commission, therefore, wishes to point out that in view of these facts the emergency basin 1 appears to have been improperly used, thereby creating conditions for its being a constant source of oil leakage and pumpage into the Guard Basin 1.

(*c*-4) *Silt Accumulator (S.A.)*: Although the S.A. has no direct connection with the Guard Basin 1, it has played an indirect role in creating an emergency in sector 6. Normally the S.A. is intended to relieve silt and sludge from the bottom of the O.S. sections in sectors 6 and 7 and from the sand trap. In actual practice, the S.A. has been regularly used over a long period to pump slop oil for storage. The statement of the refinery in its memorandum at para. 46, item (vii), that S.A. was occasionally used for storing oil does not appear to be true. There was a competition between the staff of Water and Effluent and O.M. & S.R. divisions for priority in its use and there have been many notings in the log-books in this regard (BRD-5, 17-2-68, 2nd shift—BRD-10, p. BRD-8, 6-3-68, 1st shift). Apart from the emergency regarding storage space for slops which this unhealthy relation between the staff has created in sector 6, the use of S.A. for prolonged storage of slops must have led to other complications.

Firstly, if large quantities of oil are stored in the open along with the sludge, silt and emulsion, the quality of the slop oil is bound to deteriorate, leading to difficulties in its processing in the A.V.Us.

Secondly, in the normal operation of the S.A., the water is drained out from the lower or intermediate layers of the liquid and readmitted into sector 6 for separation of oil along with the other effluents entering the weir. This water from the S.A. is bound to be heavily contaminate with oil and emulsion in view of the type of materials discharged into the S.A. and also due to the fact that even wax was dumped into the S.A. Under these improper operating conditions of the S.A., recycle of watery effluent from it into the oil separator was bound to overload the O.S. sections, thereby impairing their efficiency and finally resulting in excess oil going into the G.B. 1.

(*c*-5) *Excessive Discharge of oil from the Guard Basin*: The foregoing estimates, based on the most likely oil contents of the influent and water streams as reported in log-books, show that the slop production was far in excess of the design limits of various separators and slop storage units. The most likely quantity of the *unaccounted excess slop*, after filling all available storage space in sectors 6 and 7 and tanks 11 and 12, can be estimated to be at least 12,000 tonnes. There could not have been any space within the refinery to store this quantity. The only conclusion that can be drawn therefore is that due to severe inadequacy of space in the face of the large quantities of oil entering the oil separators, the operating staff, out of shear helplessness at the last stage of effluent treatment, must have avoided skimming from separators and guard basins permitting the oil to flow through the guard basins, out into the effluent pipe-line.

There are ample indications in the log-books (BRD-5, 23-1-68 to 29-1-68 and 6-2-68 to 26-2-68) on the shortage of space for storing oil in sector 6, and absence of skimming operations, particularly during December, 67, to February, 68. These entries must be considered genuine, in the light of the most probable excess quantities emerging from the calculations. Also the warning letters from Hajela (BRD-62 series) and Mr. Tuli (BRD-28 and 29) must be considered genuine and based on factual situation prevailing in sector 6.

(*c*-6) *Period of discharge*: At this stage, it is necessary to assess the likely period over which the estimated quantities of oil could have flowed out of the G.B. 1 sections with the effluent. Taking only 5500 tonnes which was found at Monghyr and on the river and channel, as the quantity actually discharged, if the oil content of the effluent was really 50 ppm as contended by the refinery authorities, it would require about 170 months to discharge 5500 tonnes at the rate of 32 tonnes per month as explained under 4(b) of this Chapter; this is obviously impossible. Assuming that this quantity was discharged during Nov. 67 to Feb. 68 which were the post monsoon dry months, it would mean that the average oil concentration in the effluent from the G.B. was 2060 ppm (0.206 per cent) which is possible though abnormally high. This discharge could not have been over a much longer period because the oil discharged during October would have partly dispersed into the river stream. Even assuming that the estimated quantity found between the outfall and

Monghyr was somewhat excessive and even if half that quantity (*i.e.*) 2700 tonnes is considered a realistic figure, the oil concentration in the effluent during four months' discharge would be over 1000 ppm. If it is assumed that the samples and reported analysis of effluent were correct, then, only two conclusions follow:

(1) on some days and nights when samples were not collected, very large quantities of slop oil must have flowed out, which was quite likely in view of the condition of the siphons and guard basin; (2) during night shifts, particularly in the two cold months of Jan. and Feb. 68, the operators might not have done adequate skimming, permitting emulsions and oil to flow out of the G.B. On the other hand, the excess slop generated during the period as per calculation has also to be accounted for. Therefore, over 5000 tonnes was a likely quantity. Further, whatever was discharged during Oct. 67—Feb. 68 must have mostly accumulated in the 8 mile long effluent channel due to the sluggish flow conditions in the channel. If the 5500 tonnes (appx. 6000 cu.m.) had spread as liquid on the whole surface of the channel (app. 1,000,000 sq.m.) the thickness would be about 6 mm. (abou $\frac{1}{4}$ in). This thickness, on an average, was quite likely because of accumulation which was already discussed earlier in Chapter IX. If the thickness was less than 6 mm. in some parts it would definitely have been more in smaller pools. This accumulated quantity must have started getting discharged sometime during the morning of 2-3-68 because there were reports of some oil having been seen at villages after the confluence. But most of it must have been discharged on the evening of 2-3-68 which would have taken about 8 hours to travel to Monghyr as a gush of liquid and scum probably aided by wind. This period of travel is quite reasonable. There was no justification to believe that the 5500 tonnes were discharged from the refinery on 2-3-68 firstly because this would have meant burst or deliberate draining of a heavy oil tank on which there was no evidence at all; and secondly because there were no reports of any accumulation or flow of oil from any place downstream of the confluence. It can therefore safely be stated that the quantity found between Monghyr and the outfall must have been discharged from the refinery during Oct. 67 to Feb. 68, and must have accumulated in the effluent channel after whatever has seeped into the sandy beds and must have been released from the channel sometime during the afternoon and the evening of 2nd March, 1968.

It is clear therefore that the refinery was not precisely aware of the oil content in the final effluent because only occasional sampling and testing was done. It also appears that even the limited analytical data that were reported were not studied adequately by responsible officers to draw necessary conclusions. The Commission has therefore to draw the inescapable conclusion that for a prolonged period during the dry season following the monsoon of 1967, substantially large quantities of oil have flown out of the refinery. It was likely that the quantity was over 5000 tonnes; it was possible that it could have been much more.

6. *Causes of accumulation of Monghyr:* Having established the probability of large quantities of slop oil leaving the refinery premises through the effluent, the next question to be considered is how such a large quantity could have accumulated at Monghyr?

As already discussed in Chapter IX, the refinery authorities have explained that the sudden accumulation of petroleum products at Monghyr on the night of 2nd March, 1968, was due to the stagnation and solidification in the cold season of the oily material, normally being discharged within permissible limits, in the long effluent channel and subsequent melting of solidified oily and waxy materials due to rise in temperature in the later part of February and early March, 1968. The Monghyr Municipality and the Bihar Government totally deny the accumulation, freezing and remelting theory and argued that the only cause of large accumulation of oil at Monghyr was due to the negligent and deliberate discharge of excessive quantities of oily materials during the days immediately preceding the incident.

The above two arguments and the possible causes of sudden accumulation are now discussed below:

6(1) It has been pointed out earlier through calculations and by discussion of the material placed before the Commission that there was a strong probability that excessive quantities of slop oil flowed out of the Guard Basin 1 into the effluent channel on the river bed. The Commission also found that the estimate of the quantity of excess slop oil likely to have been produced in Barauni Refinery compares well with the estimated quantity of oily matter that must have accumulated at Monghyr and found floating between Monghyr and Barauni. It was therefore concluded that substantial quantities of oily material, much more than the permissible limits, must have been discharged during December, 1967 to February, 1968 and particularly during the later half of February and upto 2nd March, 1968.

6(2) *Accumulation, freezing and re-melting theory*: The theory of accumulation of oily material in the channel, its freezing during the cold months and its re-melting in warmer climate, has been fully discussed in Chapter IX. It was concluded that there was every likelihood of oily matter stagnating in an effluent channel cut in a sandy river bed and under stagnation, when the temperatures dropped the oily matter

would have solidified and again when the climate warmed up the solidified material would have started to melt and got suddenly discharged from the pools and lagoons.

6(3) *Influence of the presence of fecal matter on accumulation*: Apart from the effluence of the low temperatures on the physical state and mobility of the oily matter, the presence of undecomposed or partly decomposed fecal sewage matter appears to have played the role of assisting formation of relatively immobile and sticky scum which would easily accumulate, alongwith waxy matter, on the effluent water surface and along the curved banks of the lagoons.

Petroleum oils, even when discharged alone directly into the river, in the quantities that might have been encountered during the later half of February, 1968, would not have caused the type of pollution that was witnessed, particularly 40 miles downstream. The slop oil, though having a high pour point, was not wholly waxy and was thin enough to get dispersed in the river flow. There was very negligible possibility of the whole quantity of oil getting accumulated 40 miles downstream. Dispersion in river water would have been difficult only if a semi-solid waxy mass such as the "slack wax" was discharged into the river, in which case the material would have formed large and soft slabs on water and floated off without much disintegration. In the present case, there was no such possibility because the samples of oily matter collected at Monghyr and the refinery at the time of the incident did not indicate the presence of large proportions of wax. (I.I.P. Test Report).

Likewise, fecal sewage matter, when discharged alone and directly into the river would have easily got dispersed, and would have had adequate dissolved oxygen available from river water to facilitate decomposition of fecal organic matter. It is well-known that river banks in India have always been used as public privies, without any complaint of pollution. Whatever be the other unhygienic aspects of such pollution, discharge of fecal sewage directly into the flowing river would not have resulted in formation of an extensive and continuous greasy scum on the surface and most unlikely 40 miles downstream.

It is, thus, clear that combination of undecomposed sewage with petroleum oils and continuous discharge of the combined effluent ever several months must have facilitated the formation of scums and their accumulation. Even this combined effluent is unlikely to have caused such type of pollution as was witnessed, if it was discharged directly into the flowing river, because dilution, dissolved oxygen and sunlight would have resulted in a reasonable degree of dispersion and oxidative decomposition of organic matter. The combined effluent was however being discharged on the sandy bed and it flowed without receiving dilution during December, 1967 to February, 1968. Further, the effluent time to settle over a stretch of 8 mile along sandy bed. Thus, the sandy bed would have acted as a filter and a sedimenting bed.

Even the long sandy bed is unlikely to have led to the pollution that was witnessed, if either of the effluents was discharged alone. If industrial effluent alone were discharged, the petroleum oils would have first of all soaked the sand downwards and gradually undergone atmospheric oxidation, particularly on hot sand particles. Such oxidation would have led to formation of mere brownish patches and perhaps flakes combined with other organic matter that might have been available on the sandy bed. In fact, during inspection of the effluent pipeline the oily patches around some of the valve chambers showed brownish flakes curving upwards, which was typical of a drying process. These areas were soaked by oil contained in the effluent. Thus, passage of oily effluent alone on the sandy bed would not have resulted in accumulation of a scum that could have been discharged later. If, in colder climates, any wax had separated out & settled on the top layer of the sandy bed, it would have melted under day heat and again soaked downwards. It is most unlikely that the wax alone would have separated and stayed on the top of the sandy bed.

Likewise, if fecal sewage alone were discharged the sandy bed, it would have undergone a good settling and gradual atmospheric oxidation, almost completely destroying the organic matter in due course. This is happening everyday in Indian countryside where concentrated human faeces is deposited.

It is, thus, clear that combination of petroleum oils and fecal matter has prevented proper oxidation even on the long stretch of sandy bed over which the effluent had to pass. It is well established that when the streams into which fecal effluent is discharged are sluggish in flow, and when availability of oxygen is low, putrefaction takes place and proper decomposition is prevented. When fecal matter is contaminated with petroleum oils, the latter would prevent or drastically reduce its oxidation. In normal sewage treatment, the presence of hydrocarbons is considered objectionable for complete oxidation of the organic matter. Fats and greasy matters are always skimmed off from settling ponds. Since the petroleum hydrocarbons are lighter than fecan sewage sludge, they tend to float on the latter, preventing availability of atmospheric oxygen for oxidation of fecal matter. If the oils are dark, the effect of sunlight is also substantially reduced, further affecting oxidation of the fecal matter.

It is thus clear that the combined discharge of petroleum oil and untreated fecal matter on the sandy bed and the complete absence of dilution have led to putrefaction and formation of scum, which included other organic matters, such as grass, algael growth etc. which gradually accumulated over the period of perhaps two or three months.

Thus while it is clear that solidification and re-melting must have taken place during January to March, 68 slow remelting during later half of February and early March by itself was not likely to cause the sudden accumulation at Monghyr. The sudden accumulation was most probably caused by excessive discharge of oily matter during the later half of February, 1968. If in addition to slop oil which should be considered mixture of heavy petroleum products, any lighter petroleum product was discharged during the last week of February, this would greatly help in increasing the mobility of the semi-solid meterial in the channel and facilitate quick melting and flow in the channel and downstream of the river.

In this connection the possibility of some down-graded ATF having been discharged with the effluent during the last week of February, 1968 was already discussed in Chapter X, and it was concluded that such possibility existed.

7. *Weathered nature of the oily discharge*— Another point requiring technical consideration is the nature of the oily discharge that has accumulated at Monghyr and in the channel. There was considerable controversy on this point. The learned Advocate for the refinery argued that fresh oil was never discharged by the refinery beyond the permissible limits as alleged by the Monghyr Municipality and the Bihar Government, and pointed out that the colour of the floating matter as described by various observers was proof of the fact that the oil was weathered and not fresh and that this fact supported the theory of accumulation in the channel put forward by the refinery authorities and in the reports of Shri Kurien CW[5], and Shri Kashyap, Chairman, I.O.C. (BRD-21). The Learned Advocates for the Monghyr Municipality and the Bihar Government have denied the possibilities of accumulation and weathering of oil and contended that the oily discharge was fresh.

The term "weathering" of oily is used to denote the changes undergone by an oil due to exposure to sun and light and oxidation by air. Weathering starts from the instant an oil is exposed to sunlight and air. The main physical properties that indicate weathering are the visual appearance of the oil which becomes somewhat slimy with a tendency to formation of scum, and changes its colour, and increase in specific gravity and flash point. The most important visual indication of weathering of an oil which is mixed with other matter can only be the change in colour because specific gravity and flash point in the case of mixed materials become unreliable although they can be reliable in the case of weathered pure oils.

With a view to demonstrate the weathering of oil, the commission poured about 500 ml. of fresh slop oil on the surface of water filled in a barrel to the top. The oil formed a layer covering the whole surface and looked dirty green with a slight reddish tinge in thin parts. The drum was kept in a lawn and the oil was exposed to the sun and light and air during the day and kept covered in the night. This was repeated for two days. On the evening of the third day, the people attending the session for oral evidence, including Shri P. K. Mishra, Shri R. B. Singh, some refinery engineers and a police Inspector who was investigating the pollution case and some press correspondents were shown the weathered oil and were explained how the experiment was done, Shri P. K. Mishra, who was asked whether the oil in the drum looked in anyway similar to the oily matter found on Ganga at Monghyr stated that in parts there was a similarity but did not agree to commit himself. The refinery engineers stated it was similar. The Police Inspector spontaneously stated that it was very similar to what he saw at Monghyr. In fact, the weathered oil in the drum was reddish and yellowish with a rusty colour and showed clearly the formation of scum; there was practically no greenish colour which it originally had.

The description of the oily matter at Monghyr given by all observers was very nearly the same, namely that it was "yellowish, reddish" and sticky and scummy. The Commission is, therefore, of the view that the oily material found at Kastaharnighat, at the Water Works and on the river was mostly a weathered material. Such weathering could easily have taken place during the stagnancy of the oil in the effluent channel which was already discussed in our earlier chapter. It was likely that some relatively fresh oil which was discharged on the 1st and 2nd March, 1968 might have been mixed with a much larger quantity of weathered material discharged earlier. The Commission, therefore, does not agree with the contention of Shri P. K. Mishra and Shri R. B. Singh that the oil at Monghyr was not weathered oil and agrees with the contention of the refinery that the oil found at Monghyr was mostly weathered.

8. *Fire at Kastaharnighat, Monghyr*: The Monghyr Municipality stated in its Memorandum (para. 17) that on the afternoon of the 3rd March, 1968, at about 1.30 P.M. there was extensive fire at the Jamalpur Railway barge and huge fire was seen at Kastaharnighat. It was obvious that the fire was due to the combus-

tion of petroleum products floating on the river at Monghyr. In this connection, the question that needs examination is whether the oily matter floating at Monghyr could spontaneously catch fire or could easily be set fire to.

Tests on the sample collected from Monghyr (IIP Test Report, Sample No. RO 341/18) on 3rd March, 1968, show that the sample had a density of 0.902 and viscosity of 9.58 centistokes at 37.8°C. The sample was not sufficient to determine flash point nor for distillation. However, comparing with the properties of samples collected at the Effluent Pumping Station on 4-3-68 (No. RO 341/17) and from the drums on 5-3-68 (No. RO 341/16), all the samples appear nearly similar. The sample from Kastaharnighat could safely be expected to have a flash point of about 70—75°C. It would not, therefore, catch fire spontaneously. Shri Kurien CW[5], stated in his report that he tried to set fire to the oily material collected in a bucket with a lighted match stick but did not succeed. He could, however, set fire to it with the help of lighted cotton waste soaked in kerosene and also found that, once lighted the oil continued to burn. The Commission is prepared to believe these observations of Shri Kurien on consideration of the properties of the material discussed above. It is, therefore to be concluded that the floating oily material was not such that could be lighted by throwing one or two lighted matches or a lighted cigarette. It could, however, be lighted with a more sustained and large enough flame. Thus, it could, for example be lighted by a burning piece of thick enough wood or burning cotton waste or perhaps red hot cinders. There is no evidence to establish the exact cause of the start of the fire. But burning piece of wood and red hot cinders could easily be available, particularly if any one, out of ignorance, was using a fire nearby. The possibility of some one mischieviously or ignorantly setting fire to the oil cannot be ruled out. It should also be noted that mere presence of the type of oil that was floating cannot by itself be the actual cause of fire. But it is a potential danger, particularly because of the quantity and area of spread in the open.

It must, therefore, be concluded that the presence of large quantity of petroleum oily matter spread over a wide area did provide the fuel for the big fire that was noticed. It was entirely feasible that the flames from such a large mass of oil could rise to sufficient height to burn or char the leaves of the tree hanging over the embankment.

We are, therefore, definite that the conclusions drawn in the earlier Chapter IX on the evidence not only coincides but is fully corroborated by the inferences deduced from technical considerations.

Thus both on the evidence as well as on technical consideration it can safely be concluded that the cause of contamination at Monghyr on 2nd and 3rd March, 1968, was due to the heavy discharge of oil alongwith the effluent from the refinery during the period October, 1967 to the end of February, 1968 and specially during the latter half of February, 1968.

SUMMARY OF THE FINDINGS REGARDING ITEM I OF THE REFERENCE

1. There was a discharge of huge quantity of oil by the refinery from 22-2-68 to 28-2-68 and substantial quantities from October, 1967, onwards which were responsible for the pollution at Monghyr.

2. The capacity of different working units in sector 6 to skim and store slops was not adequate to cope with the slop oil which was entering sector 6 with the effluent.

3. There were constant and heavy leakages over a period of at least 3 to 4 months prior to the incident in the various pump glands, condensers, heat exchangers and other upstream units from which large quantity of oil might have entered the effluent streams.

4. Negligence on the part of the refinery management in not paying heed to the warnings given about the usatisfactory conditions of sector 6 and not trying to rectify the defects.

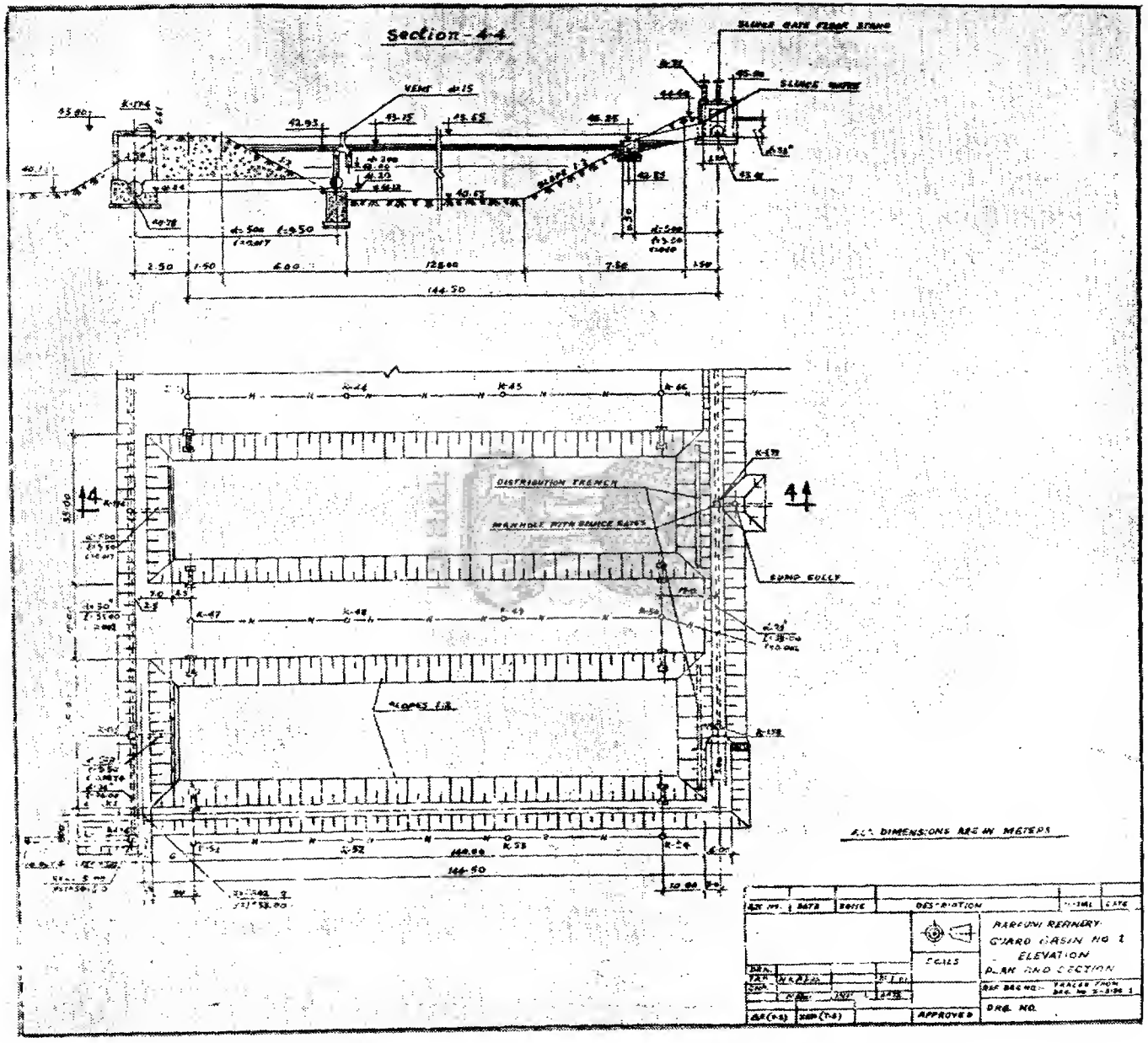
5. Non-inspection of the effluent pipe-line to see whether the effluent was mixing with the live current of the river which was the main consideration of the disposal scheme.

6. Absence of adequate facilities for inspection of the effluent pipeline upto the discharge point and improper roads and lighting conditions in sector 6 which prevented the operators from exercising vigilance during night shifts and inclement weather.

7. No provision made for patrolling of the effluent pipe-line.

8. Lack of coordination between the officers and staff belonging to OM & SR and the Water Utilities Divisions operating in Sectors 6 & 7.

9. Measures not taken to provide the required pumping plant with adequate stand-bye for quick pumpage of storm water flowing into area of sector 6 in order to ensure efficient operation of the units installed in it without their flooding in times of heavy rains


Section - 4-4
SLUICE GATE FLOOR LEVEL
SLUICE WATER
VENT dia 15
2.50
1.50
6.00
125.00
7.50
1.50
144.50
DISTRIBUTION CHAMBER
MANHOLE WITH SLUICE GATES
SUMP GULLY
SLOPES 1:2
ALL DIMENSIONS ARE IN METERS
PARADIP REFINERY
GUARD BASIN NO 1
ELEVATION
PLAN AND SECTION
SCALE
DRG. NO.
APPROVED

VARIATION OF OIL DIPS IN GUARD BASIN SECTIONS DURING 1966–1968

(NUMBERS IN COLUMNS REFER TO DAYS HAVING CORRESPONDING DIPS)

OIL DIPS IN GUARD BASIN SECTIONS

SECTION I

SECTION II

JAN. FEB. MAR. APR. MAY JUN. JUL. AUG. SEP. OCT NOV DEC.

YEARS AND MONTHS

CHAPTER XV

ITEM II OF THE TERMS OF REFERENCE

TO DETERMINE TO WHAT EXTENT THE BARAUNI REFINERY HAS BEEN RESPONSIBLE FOR THE HAPPENINGS

While discussing the material placed before the Commission for determining the correct facts of contamination we have found earlier both on the evidence and on a technical consideration that there was heavy discharge of oil (petroleum product) from the Barauni Refinery from the beginning of December 1967 upto the incident and more particularly during the last week of February and the first week of March, 1968 which had resulted in contamination at Monghyr causing loss and damage to the people there.

We had also held that this discharge could not be by the Bata & Company or any other dealer in petroleum products or by leakages from the product pipeline running below the Rajendra Bridge across the river Ganga and that it was the refinery alone which had discharged the oil.

We have found further that the heavy discharge of oil by the Barauni Refinery was due to the carelessness and negligence of the refinery and its management and to some extent defects in certain units of Sector 6. We had also found in that connection that in spite of the fact that repeated warnings were given by the top officers of the refinery right from January 1967 till the date of the incident, pointing out the defects in the units, the leakages in the pipes, glands, etc., no satisfacory attempt was made by the management to rectify those defects in time. It was also pointed out by the officers that in case those defects were not rectified urgently there was the likelihood of the oil passing to the Ganges. We are confident that if the management had taken due care the calamity at Monghyr on the 2nd and 3rd March, 1968 would have been averted.

Again, the Commission while dealing with the arguments relating to the BRD 39 had held that at the time when the approval was given by the Bihar Government on the scheme submitted and prepared by the Barauni Refinery there was no defect in the scheme and if subsequently any defect was detected it was the duty of the refinery to have rectified those defects by moving the authorities of the Bihar Government. But they did not do it.

In that connection we had also pointed out that the Factories Act places an obligation on the refinery to provide an effective arrangement for the discharge of its waste and this was its primary duty.

If the scheme originally submitted by it was defective in the sense that the discharge from the effluent was not mixing with the live current or subsequently on account of the recession of the river, the effluent discharge was not mixing with a live current, it was the primary duty of the refinery to provide another effective arrangement but this also we find was not done by the refinery.

From all the facts stated above, it becomes very clear that the refinery has been wholly responsible for the contamination of river Ganga at Monghyr during the first week of March 1968.

SUMMARY OF THE FINDINGS REGARDING ITEM II OF THE TERMS OF REFERENCE

The Refinery has been wholly responsible for the contamination of river Ganga at Monghyr during the first week of March, 1968.

CHAPTER XVI

ITEM III OF THE TERMS OF REFERENCE

TO RECOMMEND STEPS THAT MUST BE TAKEN TO PREVENT THE RECURRENCE OF SUCH HAPPENINGS IN REFINERIES IN FUTURE

The scope under this term of reference can be divided into three categories:

(a) steps that must be taken by the Barauni refinery to prevent recurrence of such happenings in future;

(b) steps that must be taken by refineries in India, in general, to prevent occurrence of such happenings in future; and

(c) steps that must be taken by the Government of India and the State Governments to ensure prevention of such happenings in future.

The Commission now proceeds to give its recommendations under each category.

(a) *Steps that must be taken to prevent recurrence of such happenings in future at the Barauni Refinery*:

I. *Recommendations for action by the refinery*—Keeping in view the findings of this inquiry in regard to the pollution incident on 2nd and 3rd March 1968 at Monghyr, which have already been discussed and summarised in Chapters VII to XIV under term I of the reference, the Commission recommends to the Government of India to ensure that the following steps are taken by the Barauni Refinery to prevent recurrence of such pollution incidents:

1. In view of the findings of the Commission that the first basic cause of the incident at Monghyr was the heavy generation of slops within the refinery, the inability of the refinery to process them as fast as they are generated, and the failure of the refinery to ensure proper functioning of the units of Sector 6 which has resulted in substantial quantities of the oil flowing out of guard basin sections with the effluent, a thorough technical study be undertaken by the refinery on the problems concerning the working of various units in the refinery leading to the discharge of high oil contents in the effluent water stream and more particularly of the units in Sectors 6 and 7, the maintenance practices, the proper use of equipments and avoidance of their mis-use and improvement of individual as well as overall efficiency in the refinery. In this regard the refinery may consult outside expert organisations specialising in operations research and industrial efficiency and management.

2. It is recommended that the present 15 mm dia. vent pipes on the siphon bends in the sections of the guard basin 1 may be replaced by wider diameter pipes with a suitable wire mesh covers on the top, to avoid the risk of their being choked.

3. Every effort should be made to minimise excessive generation of slops and to utilise the slops as fast as generated.

4. Strict control and vigilance should be maintained on the quality of the slops generated.

5. *Sample collection and analysis*—Strict measures should be taken to ensure regular collection and analysis of *composite* samples, in addition to grab samples, every day, of the final refinery effluent to determine its content of oil and other contaminants and its other properties.

5.1. Periodical check samples should be collected and analysed under the supervision of the higher officers to control the efficiency of normal sample collection.

5.2. Regular daily samples of the effluent should be collected from the inlet and outlet of the oil separators in Sectors 6 and 7, and the guard basin 1, effluent pumping station and at the point of actual discharge into the river at the end of each shift or its commencement whichever is convenient.

6. The operators and foremen should be given a thorough training on the sampling techniques to ensure reliability of the samples.

7. Regular and thorough study should be unundertaken of the analytical data on the effluent streams with a view to control and guide the operations of effluent treatment and disposal system.

8. *Fecal sewage treatment plant*—Immediate steps should be taken to ensure that the fecal sewage treatment plant is brought to its guaranteed performance and to ensure that only well-treated fecal sewage effluent is mixed with the industrial effluent from the refinery.

9. Composite and grab samples should be collected regularly every day and analysed to ensure the proper functioning of the fecal sewage treatment plant. Necessary laboratory facilities should be created immediately to undertake such analysis.

10. *Standards to be maintained on effluent quality*—The refinery should take steps to reduce the maximum permissible limits of oil and phenol contents at least to those recommended by the Indian standards Institution in its Standard IS: 2490: 1963 and the subsequent revisions as and when made. In particular, steps should be taken and if necessary additional treatment facilities should be installed to reduce the oil content to a maximum of 10 ppm and phenolic compounds to a maximum of 1 ppm in the effluent before being discharged into the river.

11. The fecal sewage treatment plants should reduce the suspended solids to 0.160 ppm and BOD to 0.136 ppm in accordance with the guarantee given by the suppliers of the treatment plant.

12. The refinery authorities should ensure that phenolic effluent receives a separate treatment, if necessary, by installation of separate treating facility, before it gets admixed with the other industrial effluent.

13. The refinery should ensure that effluent water from the coke settlers and the coking unit is given a thorough treatment and that passage of coke fines into the guard basins is strictly avoided.

14. *Organisation of effluent facilities*: A properly qualified Public Health Engineer of a sufficiently high rank should be made fully responsible for the proper functioning of the sewage and industrial effluent treatment and disposal plants. He should be assisted by adequate and well-trained staff for supervision and quality control.

15. Steps should be taken to eliminate defects regarding management of human relations which affect the operations in the various sectors with regard to removal of oil and maintenance of proper quality control on the effluent.

16. *Effluent pipeline* : Immediate steps should be taken to set right the venturi meter on the 48" dia. rising main with a view to maintain accurate record of the daily discharge of the combined effluent to the outfall.

17. An appropriate road should be constructed and other facilities should be provided to ensure regular and quick supervision of effluent pipeline upto the discharge point from about the time the main flood water goes below the level of the effluent discharge point.

18. Adequate patrolling staff should be provided to supervise the safety and maintenance of the pipelines and its fittings.

It may be noted that the construction of the road and provision of the patrolling staff are subject to the needs dictated by any modifications that may be made in the effluent discharge system in the light of other recommendations to be made hereafter.

19. *Discharge of the effluent in the river*: The refinery should ensure that the final effluent falls into the main-stream of the Ganges and gets properly dispersed in the river stream immediately after admission. In this regard, as far as possible, internationally accepted methods, as recommended by the American Petroleum Institute should be adopted. For this purpose the refinery may consider the techno-economic feasibility of the following or any other suitable alternatives and adopt a safe system:

(a) taking the effluent through a pipeline upto the Rajendra Bridge and discharging it in the middle of the stream below the bridge;

(b) taking the effluent in a pipeline and arranging its out-fall into the river at a suitable distance downstream of the refinery bridge;

(c) existing pipeline to be extended upto the edge of all weather permanent main channel of the Ganges by providing suitable R.C.C. piers or other structure, safe against erosion by river currents;

(d) regular dredging of the upstream of the present effluent channel after the monsoon of every year should be done so that the main river water enters the channel and provides adequate dilution to the effluent. Also dredging on the downstream side of the channel should be done to connect with the main river current at the nearest point from out-fall and ensure proper mixing with the river current.

20. The refinery should in any case organise regular river patrol downstream of the outfall point and periodically collect samples from the river fronts at the lower riparian villages and analyse them. Such vigilance and quality control should be exercised more particularly in the post monsoon dry season and summer.

II. *Recommendations for action by the Bihar Government concerning Barauni Refinery*: In view of the fact that the Ganga river is a State property, the Commission strongly recommends that the Government of Bihar should actively assist the refinery by undertaking annual dredging and maintenance on the northern side of the Ganga river upstream and downstream of the refinery effluent outfall point with a view to ensure that the refinery effluent receives adequate water from the main river to effect the required dilution of the effluent immediately after its discharge.

2. The Bihar Government should undertake regular river patrol downstream of the effluent

outfall, collect and analyse periodical samples of the river water at different villages downstream of the out-fall and inform the refinery of the results to ensure proper maintenance of the effluent quality.

3. The Government of Bihar should ensure that the staff of the Inspectorate of Factories frequently visit the refinery and the effluent outfall and check the quality of the effluent being discharged from the Guard Basin and at the effluent outfall and ensure that the refinery maintains proper standards.

4. The Government of Bihar should ensure that the State Inspectorate of Factories regularly collects effluent samples and gets them analysed in their Public Health Laboratories.

(b) *Steps that must be taken by Refineries in India, in general, to prevent recurrence of such happenings in future*:

The Commission has noted the fact that at present in India there are four inland refineries (Gujarat, Barauni, Gauhati, and Digboi) and four coastal refineries (Burmah Shell, Esso, Cochin and Visakhpatnam) in operation. Two more coastal refineries (Madras and Haldia) will soon start functioning. It is understood that one more inland refinery may be installed within the next five years.

With a view to study the standards and practices being maintained regarding effluent disposal and quality in typical refineries in India, the Commission visited three coastal refineries (Burmah Shell, Esso and Cochin) and two inland refineries, other than Barauni (Gujarat and Gauhati). Information of effluent treatment and disposal was obtained from the remaining refineries. The Burmah Shell and Esso refineries are discharging their effluents into channels directly connected to the sea. The effluents in both Burmah Shell and Esso refineries at the time of inspection appeared to be of proper quality, without any noticeable or significant contamination with oil. The Commission hopes that what they saw at the time of their inspection is also the general practice in these refineries. The Cochin Refinery has the most elaborate effluent treatment system with flocculation and biological treatment and the effluent was finally being discharged into agricultural fields. The Commission actually saw fish growing in the effluent water finally being discharged from the refinery. For the purposes of effluent disposal the Cochin Refinery must really be considered an inland refinery because the effluent is not directly discharged into the sea water—neither the main current nor the backwaters.

The Commission found that the Gujarat Refinery was also maintaining proper effluent quality at the time of the inspection. Here again the Commission hopes that what they saw at the time of the inspection was also the general practice. At the Gujarat Refinery the Commission saw that the effluent was being led to a dry river bed through a long masonry channel. The Commission were informed that the villagers living along side the channel, in fact, purchase this effluent water and use it for agricultural purposes. This should be considered a good enough indication of the quality of the effluent normally maintained by the refinery.

At the Gauhati Refinery, located on the banks of the Brahmaputra river, the Commission found that the industrial effluent passes through two long oil separators, each in three longitudinal sections where oil is separated, and then enters the aerator part of the settling basin. In this part, air is bubbled through several perforated pipes. The fecal sewage from within the refinery and the township, after passing through Imhoff tanks, also enters the aerator section of the settling basin. After aeration, the mixed effluent overflows into the main settling basin wherefrom the settled effluent is pumped over a distance of about 8 miles to the discharge point located near the rail-cum-road bridge. The settling basin provides a detention time of about 6 hours in dry season and about 2 hours during peak rainy season. The Commission found that no dips were ever noted in the oil separators and final settling basin but has seen records showing analytical data of effluent samples collected since 1962. The Commission were informed that since 1968 daily samples from the discharge end of the pump at the settling basin and weekly samples from the Kamakshya booster pump house (about 5 miles from the refinery) were being analysed. In these samples only pH value and oil content were regularly determined; the B.O.D. values were never determined by the refinery although some samples were stated to have been sent to the local Public Health Laboratory. During inspection, the Commission noticed bubbles rising to the surface of effluent in the settling basin for which an important reason could be the unsatisfactory or incomplete treatment of the fecal sewage before admission into the aerator basin. The attention of the refinery management was drawn to this fact and the Commission was told that they would try to rectify the operation and would arrange to determine B.O.D. regularly. The Commission found that the effluent from the coke settling pit was clean and had no smell of oil. The Commission visited on June 25, 1969, the effluent discharge point below the bridge and found the river in flood; no oily or any coloured patch was found on the water. The Commission was told that the discharge pipe was laid about 15 ft. below ground level and ends at a distance of about 40 ft. from the bank and that so far, even in 1968 which had the lowest water flow, the effluent discharge point

was well below the water level. The refinery authorities told the Commission that they have not so far tested any river water samples from downstream of the discharge point.

In the case of refineries which were not visited (Caltex, Madras and Assam Oil Company, Digboi), the Commission found from the Information supplied to them in reply to its enquiries, that the Caltex refinery at Visakhapatnam, like the Burmah Shell and Esso refineries, is discharging its effluent into a tide water channel connecting with the sea, after passing it through standard separators and settling pond; they do not adopt flocculation nor aeration. The refinery also stated that they have no regular programme of routine testing of their effluent but they analyse spot samples. Their internal specification for the final effluent is that it should be "oil-free". An analysis sheet supplied to the Commission states that the oil content in the final effluent was 'nil' which, obviously means that it was too low to be estimated by known methods. Data on nitrogen bases, pH, chemical oxygen demand, phenols, suspended solids and many other properties were reported in the analysis form. The data show that the effluent was generally satisfactory, considering the fact that it was being discharged into the sea.

The Madras refinery is just being commissioned. The drawings of their effluent treatment system were supplied to the Commission and are based on well-known design principles. This refinery would be discharging the effluent into the Buckingham canal which is connected to the Bay of Bengal fairly near the refinery. The refinery authorities should, however, ensure that the effluent does not stagnate in the canal and flows continuously into the bay.

The Assam Oil Company refinery at Dighoi discharges its effluent into inland rivers in Assam. From the documents supplied by the Assam Oil Company, the Commission finds that the refinery has oil separators near different process units and other sectors (like in the Burmah-Shell refinery) and the effluent from each separator is led, either alone or after mixing with the effluent from one or more other separators into six natural nullahs (drains) which ultimately join an inland river stream. The refinery collects effluent samples from the outlets of different oil separators, from some of the nallahs and from three points in the river down-stream of the confluence of the nallahs with the river. From the typical analytical data supplied by the refinery, the Commission finds that oil contents of effluents at the outlets of some of the separators and in the nallahs range from 150 ppm to 2000 ppm; which are very high. The Commission also notes that the oil contents in the river water at the three down-stream points where samples were collected vary from 15—40 ppm which is much more than the Indian Standard Specification for inland waters (IS: 2490-1963 and IS: 2290-1963). It also shows inadequate or improper dilution. The Commission considers this an unsatisfactory position and recommends that the refinery should take immediate steps to reduce substantially the oil contents in effluents from the separators. The Commission also wishes to point out that although the area where the AOC refinery is located may not now be densely populated and may be a forest region with heavy rainfall, such high oil contents in the nallah and main river as reported are bound to be a potential hazard to human beings and animals. Steps should be taken to rectify the situation.

Regarding the Haldia refinery, the Commission was informed that the design of the effluent scheme is still under discussion with the foreign collaborators and that the design will provide for reducing the oil content of the effluent finally leaving the refinery to maximum 10 ppm. This is in accordance with the current I.S. specification (IS 2490-1963).

The Commission, however, notes that each refinery has its own standards of effluent treatment and quality control. Whereas the Commission concedes that the effluent treatment methods adopted by refineries should be their prerogative depending upon their expertise and economics, the society can demand that the effluent finally entering public water streams, whether inland or coastal, should conform to certain accepted standards depending on the environment in which a refinery is located and the standards generally accepted by the country. It should also be ensured that all refineries should take appropriate measures to conform to the required standards and help in maintaining the cleanliness of inland and coastal waters. As explained earlier the refineries and indeed, all other industries which deal with hydrocarbon processing, should deem it their responsibility to help to maintain the cleanliness of water streams and currents. with a view to ensure this the Commission recommends the following:

1. All refineries irrespective of their location, should adopt appropriate and adequate measures and techniques to ensure that the effluent finally discharged by them into public water streams & currents conforms at least to the tolerance limits for industrial effluent listed in Table No. 1 of the Indian Standard No. IS: 2490-1963. They should also ensure that as and when the Indian Standards are revised to meet the country's requirements they should adopt appropriate measures to

conform at least to those revised standards.

2. All refineries in India should adopt appropriate and strict measures to take representative samples as frequently as possible, of the effluents emerging from different treatment units in their respective refineries and the final effluent being discharged into a public stream. They should be required to analyse at least one composite sample per day of the final effluent being discharged.

3. All refineries should be required to maintain full records concerning the generation and disposal of slops.

4. All refineries should make it a practice to periodically get representative composite samples of the final effluent being discharged by them analysed by a public laboratory so as to have on record results of independent testing laboratories. Such information should be made available by the refineries at regular intervals to the Inspector of Factories and Public Health Authorities in the respective States in which the refineries are located.

5. All refineries which are discharging their effluents in inland stream should, of their own accord, undertake patrolling of the streams over a sufficiently long distance, downstream of the discharge point and periodically collect and analyse samples of waters from different points downstream. All refineries which are discharging their effluents into coastal waters or backwaters should of their own accord patrol the coast as required to check whether any accumulation of oily matter takes place. The refineries should keep records of such patrolling and inspection to be made available to the concerned authorities as and when required.

(c) *Steps that must be taken by the Government of India and the State Governments to ensure prevention of such happenings in future*:

It is well known that under the Indian social conditions, a substantial proportion of the country's population draws its water supply for its daily needs directly from the river streams. This practice will continue for a long time to come. The Common public is by and large ignorant of the dangers of pollution of public waters by hydrocarbon contamination, as distinct from the contamination by water soluble chemicals. It must be emphasized that polluants from normal chemical industries are either soluble or easily disperse in water with the result that an aqueous effluent carrying such polluants can effectively get diluted and dispersed within a short distance after meeting a more powerful water current. In the case of oily effluents that emerge from refineries and petrochemical industries, hydrocarbons, having least solubility in water compared to many other organic polluants and also being lighter than water, always float as a distinct oily layer and tend to accumulate in quiescent streams. The pollution from hydrocarbons has posed special problems, because they are not easily oxidizable or biodegradable; they are toxic to aquatic life and bird life as well as to human beings and animals. The pollution from hydrocarbon streams should, therefore, be given special attention, as it has been in all industrial nations. Another important point is that pollution of waters by hydrocarbons is a part of the wider pollution of the over-all environment by hydrocarbon processing and utilisation. It is, therefore, essential that the refineries and also other allied industries dealing with hydrocarbon processing should become conscious of their responsibility to the society and themselves exercise proper vigilance and care to maintain proper standards of effluent quality with a view to avoid contamination of water streams and atmosphere. In return, the society should assist the industry, which is essential for the prosperity of the country, by bringing to their notice the dangers of their effluents and helping in the disposal of the effluents. This co-operation and understanding are well developed in industrially developed countries.

In view of the conditions prevailing in India the Commission is of the opinion that conscious efforts would be essential on the part of the refineries as well as civic bodies and Governmental authorities to maintain cleanliness of inland and coastal waters and at the same time to help the industries to operate efficiently and without impairing their economics.

It is also important to note that Indian rivers are often passing through many States and it, therefore, becomes essential that uniform standards are maintained by all States. In any case it should be ensured that the standards maintained by the upper riparian States with regard to effluent disposal and quality of inland waters should not be significantly less than those being maintained or required to be maintained by the lower riparian States, for otherwise the pollution occurring in the upper riparian States would travel downstream, sometimes within a short distance into the neighbouring States. This can lead to difficult situations and undesirable controversy between different States which should be avoided.

With a view to ensure safety of the public and uniformity of standards of inland and coastal waters, the Commission strongly urges upon the

Government of India and the State Governments to adopt the following measures:

1. The Government of India should pass an Act controlling the quality of the effluents being discharged not only by the refineries but also by all other industries processing hydrocarbons which discharge effluents either into public inland or coastal waters or into dry river beds. The Government of India should form a Central Board for the control of Environmental Pollution resulting from all industries processing hydrocarbons. The Board should have within its purview the control of polluants admitted, not only into water streams but also into the atmosphere as a result of hydrocarbon processing.

2. The Central Act should prescribe the authority who would exercise proper control of pollution and award penalty for violation of the provisions of the Act; and

3. The Central Government should direct the State Governments also to pass an Act controlling the quality of the effluents being discharged not only by the refineries but also all other industries processing hydrocarbons which discharge effluents either into public inland or coastal waters or into dry river beds on lines similar to the Act passed by the Union Government prescribing the authority who would exercise control of pollution and award penalty for violation of the provisions of the Act. It should also form a Board for the control of environmental pollution which will work in co-ordination with the Central Board.

It should be emphasized at this stage that pollution control is fast becoming a major problem in industrialised countries. Large sums of money are being spent to achieve and maintain the desired standards of environmental health. Pollution control measures are almost invariably very expensive based on modern scientific developments and do not contribute to the improvement of the economics of the industries which discharge the polluants, particularly when the standards become more and more stringent. In the opinion of the Commission, it is, therfore, obligatory on the part of the Union and State Governments and civic bodies to offer every assistance to the industries to control pollution. The need for proper understanding and willing co-operation between the civic bodies, the Government and the industries cannot be overemphasised. Any measures that the Government may take to control pollution should not stifle or hamper the industry but rather firmly guide, control and assist the industry to maintain proper standards. On the other hand, such co-operation should not be permitted to degenerate into circumvention of statutory provisions and compromise of standards, irrespective of the fact whether the industry is owned and operated by public or private sector, by Central or State Governments. Also expediency should not be permitted to be an excuse to contravention of provisions safeguarding the public health. The law on pollution control must be of the Nation for the whole nation and based on modern scientific thinking and practice.

The Commission, therefore, recommends that apart from the Central Act and the Board, each state should not only pass an Act on lines similar to the Central Act but form a suitable pollution control body with representatives from industry, Public Health and medical profession, research organisations, civic bodies and the Government to ensure that proper standards are maintained and the industry progresses efficiently. The functions of the State Pollution Control Boards should be co-ordinated by the Central Board for pollution control as suggested above. In this connection, the Commission is happy to note that there is increasing awareness on the part of the State Governments regarding pollution of river and coastal waters and that some of the State Governments have already formed or are taking steps to form pollution control bodies. The Government of India should ensure that pollution control becomes a co-ordinated all-India activity to ensure the healthy growth of the nation and maintenance of healthy environment all over the country. This is of utmost and special importance in a country with a large population majority of whom suffer from mal-nutrition and poor resistance to hazards against health. The Commission sincerely hopes that urgent and effective steps will be taken by the Government on the subject.

SUMMARY OF THE FINDINGS REGARDING ITEM III OF THE TERMS OF REFERENCE

1. The Commission has recommended what steps have to be taken by the Barauni Refinery and the refineries in India, in general, to prevent recurrence of such happenings in future.

2. It has also recommended what steps have to be taken by the Government of India and the State Governments to ensure prevention of such happenings in future.

CHAPTER XVII

ITEM IV OF THE TERMS OF REFERENCE
TO ADVISE WHETHER THERE HAS BEEN ANY NEGLIGENCE OR CARELESSNESS ON THE PART OF THE REFINERY MANAGEMENT AND STAFF IN THE DISCHARGE OF THEIR PRESCRIBED DUTIES

The learned lawyer for the Refinery in his written arguments--Vol. V—while conceding that the Commission is competent to go into the question of the negligence and carelessness of the refinery management and the staff contended that the question of negligence and carelessness should be confined to the factum of contamination of water of the river Ganges in the down-stream of Barauni Refinery during the last week of February (or earlier) and first week of March, 1968, as the scope of clause V is limited by the parent term, Item I.

The Commission is not prepared to accept the interpretation given by the refinery to clause V of the reference. A proper reading of the terms of reference would show that the period referred to in clause I of the reference relates to the contamination itself whereas the other terms of reference which relate to responsibility of the refinery and the negligence or carelessness of the management and the staff are not limited to the period during which the contamination actually occurred, nor is its scope limited by clause I.

What the Commission has first to do is to find out the cause of contamination and after having found that, it has to see whether there was any negligence of the refinery and, if so, whether it was by the management or the staff. While considering this, the scope of the inquiry cannot be limited only to the period of actual contamination. For it may be that the contamination may have occurred due to the negligence of the refinery or its management or the staff earlier to the incident. It is, therefore, clear that the question of negligence or carelessness cannot be confined to that period nor can its scope be limited and the Commission can refer to the facts prior to the incident to see whether there has been any negligence or carelessness as such. The very fact that the refinery itself in its argument has laid great stress on the fact that BRD 39 right from the inception was a defective order shows that this matter also requires a consideration prior to the actual happening. In the light of this we now proceed to consider the material placed on record to see whether there has been any negligence and carelessness. But before doing so we would like to see what is meant by negligence. 'Negligence', in the ordinary sense, according to dictionary meaning, would mean want of proper care which presupposes a duty to avoid acts of omission which can be reasonably foreseen to be likely to cause physical injury to person or property. First essential thing, therefore, to see is whether there was any duty on the refinery to exercise care.

The refinery started its operation under a scheme and one of its main conditions was that the waste discharge should meet and mix with the live current.

Apart from this obligation there was a duty cast under the Factories Act on the refinery to submit an arrangement or a scheme to the Inspector of Factories for the proper disposal of the waste. The refinery did submit a scheme whic was approved by the Government of Bihar. This scheme, according to the stand now taken at the time of the argument, is that it was defective right from its inception. The scheme it may be noted was prepared by the refinery itself. If the scheme was defective, it was its duty to get it rectified.

Apart from the above two obligations there was the third obligation under the Common Law.

It is a well-known principle that every user of water from the river is entitled to have the use of that water for the purpose for which it is being used. Any act by a party which renders the use of such water unsuitable to the other would give rise to a cause of action.

Thus it would appear that apart from the Common Law obligation both under the scheme as well as under the Factories Act, duty was cast on the refinery to exercise care. Next question we have to see is whether the refinery and its management exercised this care. In the earlier chapters we have held that there was huge discharge of oil from the refinery. Now we have to see whether the discharge of huge quantity of waste from the refinery was due to the negligence of the refinery management or to a deliberate act or to the defects in the design of equipments.

From the various notings of the Operators and the Foremen continuously in the log books pointing out the leakages in the plugs, the glands, the valves and the pumps, the overloading of the tanks, the non-availability of the

appliances for taking dips, not providing sufficient light for taking the readings, no regular periodical inspection of the pipeline made by the officers concerned, no patrol men provided to periodically check the condition of the valves, no path provided along side the effluent pipeline, absence of co-ordination between the people working in Sectors 6 and 7 and the defects pointed out in Sector 6 by the top engineers of the refinery right from the 30 January 1967 to 2nd/3rd March, 1968, BRD 30, BRD 28, BRD 74, BRD 92, and BRD 62 series go to show that in spite of repeated warnings being given and attention of the authorities being drawn to the defects shown, no satisfactory attempt was made to rectify them. The refinery has been based on a worked-out and calculated project which was examined and approved by the Public Health and Public Health Engineering Authority of the State of Bihar. One of the conditions was that the effluent should mix with the live river current. CW 6, the then General Manager, Barauni Refinery in his deposition has admitted at p. 740 (ER) of his evidence that the scheme was that the effluent which will be discharged into the river will have 50 parts per million of oil content, it will mix with one-third of the discharge of the river. Then again at p. 742 (ER) on a question put by one of us (Dr. Krishna) he said that all that was necessary was that it was discharging into the river.

From the report of Shri Kurien, it appears that when the effluent treating facilities at Barauni were designed they had built a six-mile long pipeline to transport the effluent from the refinery to the middle of the stream. It also says since the last monsoon, however, the river had changed course as much as even two miles at this point with the result that the effluent after October 1967 was being discharged not into the flowing stream but on the sand bed. In course of time the effluent cut a channel which was to-day approximately eight miles long and joins the Ganges down-stream. He as further pointed out that at the time of the year, *i.e.*, October and November, it is comparatively cooler and since effluent was containing oil of mostly higer molecular weight, it contained large amount of waxy matter which under the prevailing temperature conditions could have frozen. The result could have been that the water might have seeped into the sands which the frozen oil could have settled on the surface. In course of time the quantity of water coming from the effluent pipe was such that it cut, for itself, a small channel. This could have taken considerable time. During this period whatever oil that came with water could not find its way into the Ganges but got itself accumulated on the sand bank. Continuing further he says when summer came and the ambient temperature increased under the sun's heat the accumulated oil slowly melted, loosened itself and flowed into the river in the form of flakes, in a way, miniature avalanches. He proceeds further and says once the frozen oil started floating on the river, it could easily move down-stream without getting itself dispersed in the water.

It is admitted by the highest officers of the refinery including the engineers in-charge of the effluent pipeline that right from the beginning none of them ever inspected the pipeline to see whether the waste was mixing the river water. According to CW 6, he had given special instructions for inspection of the pipeline every year once before and after the monsoon. It is admitted by him that there is no record to show that any inspection was so made. Such an inspection would have been possible had there been a track provided along with the pipeline. It is pertinent to mention at this stage that under the design it was proposed to have a road right upto the discharge point but this was abandoned owing to the heavy expenses as deposed by Shri Balwant Singh, CW 6. During monsoon period three-fourth of the pipeline is under water and there being no road, and no boats provided, it becomes impossible to check the pipeline and see whether there are any leakages. When the Members of the Commission first visited the refinery in the month of August it was practically impossible for them to see the discharge point and they had to do so in a helicopter. Even in September, 1968, when the Commission had its second sitting then too it was not possible. Only in the next sitting in October, the Members could see the discharge point following a different route. They had, as a matter of fact, first attempted to follow the path along side pipeline but they could only go upto a stream which was crossing the pipeline. They even attempted to walk on the pipeline whose top surface was partly above water but were forced to abandon the attempt because the pipe was slippery and the attempt appeared to be risky.

CW 6, Shri Balwant Singh, in his evidence has stated that oily for about 2—8 weeks in the monsoon season the discharge point cannot be approached and otherwise it is jeepable. This is his solitary statement, not supported by any other evidence. To our minds this statement does not seem to be correct in view of the experience the Members had and the discussion they had with the engineers of the refinery.

From a perusal of the log book for AVU 1 (with effect from 1-1-1968 to 29-3-1968—EX. BRD 11) and from log book for AVU 2 (from 1-1-1968 to 24-3-1968 Ex. BRD 12), it can be seen that many valve glands and packings in pipeline have shown regular leakages; sometimes considered profuse, on several days in February and March, 1968.

Apart from these notings in the log books which show leakages of the valves, glands, BRD 62 series has noted that during the inspeciton of Sector 6 by the Deputy General Manager it was pointed out that the Pumps at 542, *i.e.*, fecal pump house and the skimmed oil pumps of job 532 are giving constant trouble, the various causes of early break-down of these pumps were also pointed to the Deputy General Manager. Inter-office Memo BRD 62-D, dated 12/14-4-1967 shows that the oil dips in the various facilities have gone down considerably but due to non-availability of the pumps at Job 532 the situation has again become very grave. It is also noted in this inter-office Memo that the operator informed him that one pump of Job 532 is not taking any suction. The other pump on the above facility is not existing for the last over one month and this has been the main cause for creating this condition in Sector 6.

Inter-office Memo BRD 62-H dated 8-8-1967 shows that owing to the pump H3 of Job 525 being out of order and the pumps H1 and H2 being unable to cope with the pumpage of heavy rain water, serious emergency in both Sectors 6 and 7. Inter-office Memo BRD-I dated 10/11-8-1967 shows that there were leaks in the dykes around the oil separators and the emergency basins and the pumps of Job 525 were not able to pump out all this water expeditiously as pump H3 of industrial and storm water pump house was removed by DME (Zone B) to the Mechanical Workshop for repairs on 10-8-1967. BRD 62-J dated 29-8-1967 also shows that the dykes around the emergency basins, oil separators storm water drain and fecal pump house pit need to be repaired. Inter-office Memo BRD 62-M dated 20-11-1967 shows that both the pumps of Job 542 have gone bad and have been removed and transported to the work-shop on 15-11-1967 for repairs. It also shows that the pump No. H1 of industrial sewage water pump house of Job 525 in Sector 6 was still in work-shop for repairs and there was no progress on any other works concerning civil department. BRD-R dated 29-12-1967 shows that in the pit of Job 525 lot of fine coke comes from the coking unit and is getting accumulated day by day. In addition to this, the level of the fine coke sludge is getting deposited at the bottom of the pump house pit. There is also a note about the fecal pump job 542 to the effect that these pumps go out of order rather too frequenty because of water entering into the bearings, etc. BRD 62-W dated 28-2-1968 shows complete stopping of the skimming.

The note of Shri Tuli dated 8-1-1968 (BRD-29) shows that as per the present arrangement the slop connections are provided in tanks 11 and 12 only and none of the other two tanks has provision for receiving the slops into the receiving tanks.

Apart from the negligence in operation, maintenance and supervision of the equipments, units and sectors concerning the presence of oil in the effluent water, there is also evidence to show defects in the organisation and distribution of functions among staff. There has been poor co-ordination of operations conducted in Sectors 6 and 7 with reference to skimming of oil from separators and its transfer to oil pumping pit or the temporary storage and separation units. These operations were divided between the staff of the Power & Utilities Wing and the Oil Movement and Storage Receipt Wing (OM &SR) and the relations between the staff of these two wings have not been satisfactory. There have been serious complaints by the staff of OM&SR wing on the attitude of those of the Power and Utilities Wing on the ground that the staff of the Power and Utilities Wing were in the habit of skimming oil from Sector 7 and transferring it to some units in Sector 6 without prior intimation to the staff of OM&SR working in Sector 6 and further that the Power and Utilities staff of Sector 7 used to keep some of the units in Sector 6 under their control, without making them available to the OM&SR staff for skimming of oil when required. (Brd 2 pp. 27 and 56; BRD 5 dated 8-2-1968 morning shift A; BRD 10 dated 4-3-1968 10 PM-6 AM shift p. 6-3-1968, 10 PM-6 AM shift). The Commission finds that this poor co-ordination between the staff has been partly responsible for the serious situation during February 1968 regarding non-availability of space when required for skimming of oil from Guard Basin 1 sections and other units, which has resulted in building up of oil in the G.B. Sections and flow to effluent pumping station. In this regard the Commission questioned Shri B. D. Gupta, CW 2 (ER. p. 186-187; 168—171) and Shri S. G. Hyder, CW 4 (ER. pp. 426—429, 441, 450—452, 465-466 and 522) and found that the replies of Shri B. D. Gupta were not satisfactory and Shri Hyder admitted poor co-ordination.

The Commission found another situation showing defective distribution of function among the staff. This concerns the Guard Basin 1 and oil separator sections in Sector 6 where the measurement of dips and the skimming of oil floating on the top of the effluent water were the responsibility of the OM&SR staff whereas the water below the oil layer was the responsibility of the Power and Utilities staff (ER. pp. 164, 171, 265). This dual responsibility has resulted in two undesirable situations.

Firstly due to the fact that according to the allotment of responsibilities the removal of oil from the effluent in all units of Sector 6 was the responsibility of the OM&SR staff, the Power and Utilities Staff who were incharge of the units of Sector 6 and the entire effluent treatment and disposal system did not care whether

or not there was space available to OM&SR staff to skim oil; as a result, whenever the OM&SR staff could not skim oil due to non-availability of space, oil levels were building up in the Guard Basin sections.

Secondly the then Executive Engineer, Power and Uitlities, Shri B. D. Gupta, when examined by the Commission and cross-examined by the learned counsels, denied the high oil dips of 96—100 cms. found in the G.B. Sections on 25-2-1968 by his own staff (ER. p. 212, 227—229, 250-251). This appears to be an excuse on his part to escape his responsibility for the quality of effluent by disregarding the fact of high oil dips and consequent flow of oil to the effluent pumping station.

Thus in the opinion of the Commission non-availability of adequate space to skim oil from guard basin and oil separator sections of Sector 6 during January and February 1968 and more particularly during 20th February to 6th March, 1968, was not only due to the large quantity of slops entering Sector 6 every day but also largely due to the unsatisfactory allotment of duties among the concerned staff of Sectors 6 and 7 and the uncongenial atmosphere among these staff of the refinery regarding the use of the units. The Commission feels that this is a sad reflection on the management.

During our (Commission's) inspection the refinery personnel admitted that fecal sewage treatment also has not been functioning satisfactorily since its construction in 1966-67 and the plant has not yet been handed over to the refinery by the contractors. It may be noted that town-ship had already started much earlier. The town-ship sewage has been going to the effluent pumping station without any treatment most of the time which fact has also been admitted by the officer of the refinery, CW 10, at p. 928 (ER). One of the major purposes of the sewage treatment facility, is to remove the unsightly and abnoxious floating matter of which grease is a major consideration. In the absence of any treatment, all the greasy matter from the town-ship sewage goes into the river.

From above discussion it would appear that apart from the defects pointed out in the various units, and the alarming reports given, no action was taken by the management to rectify those defects. This inaction on the part of the management and the absence of co-ordination among the staff are clear proof of not only carelessness and continuous negligence on its part but also poor management.

It is next urged by the learned lawyer for the refinery that the incident on 2nd and 3rd March, 1968, at Monghyr was not the result of any negligence or carelessness on the part of the management of the refinery or its staff but was due to the freak of nature or unforseeable event and the law affords protection to the persons concerned and relieve them from all responsibilities.

In this connection, the learned lawyer for refinery relied on the following quotations from Clerk and Lindsell on Law of Torts, 10th Edition 47: "Act of God and inevitable accident."

But the most difficult question of all is the problem of inevitable accident, *i.e.*, a consequence which might have been foreseen but not as such that the defendant might reasonably be expected to guard against it. ... and Windfield —Law of Tort, 4th Edition 1948: "S. 15: inevitable accident".

Inevitable accident is defined by Sir Frederick Pollock as an accident not avoidable by any such precautions as a reasonable man doing such an act then and there could be expected; and the following cases:

Torts C 107 CF: The Marpesia (1872 LR 4 PC 212, 220) and Dudedin in Pardon v. Harcourt—Rivington (1932, 146 LT 3.1, 392).

Nicholas vs. Marsland (1875, 1876) LR. 10.255.

In order to appreciate the contention of the learned lawyer for the refinery we have to see what is meant by an Act of God or inevitable accident.

Act of God or inevitable accident is that which the party sought to be charged could not possibly prevent by the exercise of ordinary care, caution or skill (The Schwan, the Albano, 1892, p. 419 CA at 434).

Where an injury results from natural causes which could not have been foreseen and could not have been avoided by any amount of foresight and care which could reasonably have been expected, it may be said to result from an Act of God.

Forward vs. Pittard 1785 1 Term Ref. 27 at 330;

Thomas vs. Burmingnot Canal Co. 1879 49 SJQA 51 DC;

Dickson vs. Metropolitan Board & Works 1881 7, Queens Bench Edition 418.

We may also refer to the case of Sternly vs. Powell 1 Queens Bench 856 and to the following passage in Haulbury's Laws of England, 37 Edition p. 144 on the subject of tort:

"Inevitable accident ... Act of God": "Where an injury which could otherwise be tortious occurs because of an inevitable accident, *i.e.*, to say by reason of an occurrence which could not at the time of happening have been avoided even after exercising due care and skill as any prudent man is expected to do the defence of inevitable accident may in certain cases be raised.

The quotation and reference cited by the learned lawyer for the refinery also refer to the same principle and does not require any detailed discussion.

Thus it would appear that the refinery and its management on whom there was a duty to exercise reasonable care has miserably failed to discharge that duty which has resulted in the contamination of the river at Monghyr causing loss and damage to the people there.

We have next to determine the responsibility of the individual officers for the negligence and in this connection the Commission has examined the information supplied by the refinery at the request of the Commission on the organisation of the effluent treatment and disposal facilities and studied the duties allotted to the different staff in Sectors 6 and 7 dealing with water and effluent and slop oil removal. In the opinion of the Commission, the concerned operators and foremen appear to have been discharging their duties generally satisfactorily and recording the operations and observations truthfully in the log books.

The Commission also notes the fact that although Shri V. B. Hajela, Deputy Electrical Engineer, in-charge of the Power and Utilities Wing has tried to explain away his warnings by giving evasive and distorted replies in his evidence, his inter-office Memos, BRD 30 and BRD 62 series, clearly show that has exercised regular supervision of the Sector 6 operations and has repeatedly warned his higher authorities for more than one year prior to the incident about the unsatisfactory condition of Sector 6, the likely danger of oil going out of the Guard Basins to the Ganges with the effluent and the need for quick improvements in the situation. It is obvious that his inter-office memos containing his warnings have not received due attention by his superiors, Shri Ayyar, Chief Electrical Engineer and Shri Harnal, Deputy General Manager (Technical). In this connection, the Commission examined the minutes of the Production Co-ordination meetings held from August 1967 to April 1968 under the Chairmanship of Shri Harnal, where the problem concerning Sector 6 were discussed among other matters. In the minutes of the meetings held in August and October, 1967, the Commission found notings to the effect that the maintenance of Sector 6 was discussed and that the Deputy General Manager (Technical) instructed other officers to take necessary action. The Commission could not find any notings except in the meeting on 19-12-1967 to show that the rising oil dips and high slop generation were discussed and that a sense of urgency prevailed to deal with high slop generation and oil content of the effluent and the pollution problem. In the meeting on 15-4-1968, *i.e.*, after the incident the collection and testing of effluent samples was discussed for the first time. The Commission, after considering all these facts and documents placed before it, is of the opinion that Shri Ayyar and Shri Harnal did not take effective steps to ensure reduction of slop oil generation and to collection and testing of adequate representative samples of the effluent.

The Commission is further of the opinion that the frequent leakages over a long period of pump glands, pumps, valves, condensers, coolers and heat exchanges about which frequent complaints were noted in the log books, must be attributed to poor maintenance of these units. A departmental enquiry may be made to ascertain the reasons for poor maintenance of the units and whether it was due to inefficiency of the concerned persons or inadequate spare parts and working materials or both.

The Commission finds that the attitude of Shri B. D. Gupta, Executive Engineer, in understanding the real operational needs of Sector 6 and removal of slop oil from the effluent was unsatisfactory and narrow-minded. Perhaps it was this realisation that made the management change his duties soon after the incident.

The Commission finds that the decision of the then General Manager, Shri Balwant Singh, to stop construction of the road along the effluent pipeline was extremely unwise. He apparently thought that he was saving expenditure but failed to realise that the road was the only facility available to the staff to efficiently inspect the pipeline and effluent discharge point and collect frequent samples of the final effluent being discharged. By removing this only facility, he prevented his staff from discharging their duties on the inspection.

Despite the non-availability of a regular road, Shri C. D. Ayyar and Shri T. S. Rao who were in-charge of the effluent pipeline could have travelled by jeep by the kacha road at least in the dry months (November, December, January and February) to inspect the effluent line and discharge point. If they had inspected frequently the effluent discharge point in December, 1967 and January and February, 1968, this calamity could have been averted. This shows lack of sense of responsibility on the part of these officers.

In the opinion of the Commission, the officers at the top management level, namely, Shri Balwant Singh, the then General Manager, Shri G. S. Harnal and Shri C. D. Ayyar in-charge of the effluent disposal system, were totally ignorant of the facts:

(i) that only effluent from treated fecal sewage should be mixed with the in-

dustrial effluent before the mixture is discharged into the river, and that this was a condition of their scheme approved by the Bihar Government; and

(ii) that after the monsoon of 1967, the final effluent was not discharging into a live current but on a sandy bed and was, therefore, not receiving proper dilution.

The Commission takes a serious view of these matters as the discharge of polluants into the river, without proper treatment of the effluent, was bound to cause serious pollution of the river on which all lower riparian population depend for their normal water supply.

SUMMARY OF THE FINDINGS REGARDING ITEM IV OF THE REFERENCE

1. If BRD 39 was defective from its very inception it was the statutory duty of the refinery to get it rectified.
2. The refinery did not control the flow of larger quantities of oil beyond the permissible limit of 50 ppm. into the effluent pumping station and therefrom to the river through the 48" rising main.
3. In the Guard Basin the effluent surface should not have had any noticeable and continuous film of oil. If the upstream units were operated and maintained properly even according to the design the film should have been very thin and almost unnoticeable. The very fact that the thick layer of oil was constantly maintained for several months and years shows defective operation of the plants and gross negligence.
4. Untreated fecal sewage was allowed to pass and get mixed with the oil containing effluents which is well known as objectionable.
5. Adequate facilities for inspection of the pipeline were not provided which led to an obvious slackness in inspection.
6. Absence of proper co-ordination among the members of the staff of Sectors 6 and 7 has aggravated the situation.
7. The three top officers of the management of the refinery, namely, Shri Balwant Singh, the ex-General Manager, Shri G. S. Harnal, the Deputy General Manager (Technical) and Shri C. D. Ayyar, Chief Electrical Engineer have failed to ensure the efficient treatment of the effluent and to discharge it in the proper manner into the river.
8. Poor maintenance of some of the equipments in the production units has resulted in the generation of large quantities of slops during December 67 to early March 68 which has over-loaded the units of Sector 6.

CHAPTER XVIII

ITEM V OF THE TERMS OF REFERENCE

ARISING OUT OF IV, TO RECOMMEND THE FURTHER ACTION, IF ANY, THAT MUST BE TAKEN

With regard to this clause of the reference strong objection is taken by the learned lawyer for the refinery relying on the case of Ramkrishan Dalmia *vs.* The Union of India (1955 SC 538) that this reference is illegal and invalid.

What is urged is that the Commission no doubt is competent to find negligence and also how much damage was caused but it cannot award punishment.

In order to appreciate the argument of the learned lawyer for the refinery we have first to refer to the facts of the Dalmia's case.

It appears that before the Government of India appointed a Commission to inquire into the administration of Dalmia-Jain Companies under the commissions of Inquiry Act, 1952, there was already a criminal investigation into the affairs of one of the companies and actually as a matter of fact an F.I.R. was also issued and account books were seized.

One of the terms of reference in that case (item 10) was to inquire into any irregularities, fraud or breaches of trust or action in disregard of honest commercial practices or contravention of any law (except contravention in respect of which criminal proceedings are pending in a Court of Law) in respect of the companies and firms whose affairs are investigated by the Commission which may come to the knowledge of the Commission (and the action which in the opinion of the Commission should be taken to act as a preventive in future cases).

This clause was challenged before the Supreme Court on the ground that it overlapped matters, *viz.*, misappropriation and breach of trust which were the subject matter of the criminal case and the Government of India was not competent to refer this matter to the Commission of Inquiry.

The Supreme Court held that the clause insofar as it required the Commission to suggest redress or punishment was beyond the powers of the Central Government under the Commissions of Inquiry Act.

In the light of the above pronouncement of the Supreme Court we now proceed to consider Item V of the present reference.

A careful reading of the clause will show that what the Commission is asked to recommend is not any action by way of criminal prosecution or suit for damages but a departmental inquiry or a disciplinary proceeding against the officers of the refinery who have been found careless and negligent in the discharge of their duties. Such a recommendation, in our opinion, is absolutely necessary for the efficient and better running of the refinery. We may, in this connection, refer to the case of S. A. Venkatraman *vs.* The Union of India & another (1954 SC report 1150). In this case the Supreme Court was dealing with the question of the nature of the proceedings of the Public Servants Inquiries Act, of 1854. It was held that though the words prosecution and punishment were used in the Act, the enquiry was purely for the purpose of instructing the mind of the Government with regard to departmental action to be taken against the delinquent officers.

In clause 5 of the reference the words used are "further action to be taken". These words cannot, in our opinion, be equated to the expression "redress or punishment" occurring in Dalmia's case and on that basis it cannot be said that this item of reference is invalid or illegal.

The Commission under the above clause would therefore be justified in suggesting to the Government of India what action should be taken. Accordingly the Commission makes the following recommendations :

1. The Government of India should get a detailed inquiry made into the matters indicated under discussion on clause 4 of the reference and also into the conduct of the officers of the refinery named therein and take suitable action.
2. The Government of India should direct the Indian Oil Corporation to make a thorough and careful study of the maintenance practices prevailing in the Barauni Refinery, if necessary, by using modern management techniques, for the efficient and better working of the refinery as the present maintenance of the various units is unsatisfactory.
3. The Government of India should also direct the Indian Oil Corporation to take suitable steps for maintaining better relations between the staff working in the various units and try to improve the co-ordination of functions allotted to its staff members.

4. The staff of the Inspectorate of Factories of the Government of Bihar do not seem to realise the importance of regular checks of the effluent pipeline running across fields upto the river Ganga and also of the effluent actually being discharged into the live current. The Commission, therefore, suggests that the Government of India should draw the attention of the Government of Bihar to this fact for future improvement.

5. The Government of India should ask the Government of Bihar to provide due facilities to the Barauni Refinery to protect the effluent pipeline and its fittings from being tampered with by the villagers as the attention of the commission was brought to this fact by the management of the refinery at the time of the inspection.

CHAPTER XIX

ITEM VI OF THE TERMS OF REFERENCE

TO REPORT ON THE LOSS OR DAMAGE TO THE PUBLIC CAUSED BY THE POLLUTION OF THE RIVER AND TO RECOMMEND WHAT, IF ANY, RESTITUTION THE INDIAN OIL CORPORATION SHOULD MAKE IN THAT CONNECTION TO THOSE ADVERSELY AFFECTED

Shri Baldev Prasad Singh, the learned lawyer for the Barauni Refinery in his written arguments (Vol 6 p. 1034) has raised a legal point which was not raised any time earlier either in the Memorandum or through a separate petition. The point raised is that since the words used in the reference are : "to those adversely affected" which only refer to the class and category indicated by the words "to the public and not whole Public", the Municipality, which represents the whole puhlic, is not entitled to claim damages.

The contention of the Monghyr Municipality and the Bihar Government is that since the Municipality is a legal entity it comes within the category and represents the whole public or class of public and as such is entiteld to claim damages. Similar argument is raised by the Barauni Refinery with regard to the claim of damages by the Bihar Government that since the State of Bihar was a creation of the Constitution, it does not come under the category of the members of public adversely affected. Though this objection is raised in the written arguments for the first time, but since it was a pure question of law, we permitted the lawyer to advance his arguments. After hearing the arguments, we do not find any substance in the contention of the learned lawyer for the Barauni Refinery. So far as the Municipality is concerned, it cannot be denied that the Municipality is a legal entity, a body into which the Law infuses, the animus of a fictitious personality. In other words, it is a legal person just as much as an individual vested with the control of public funds and public property for discharging its functions and duties towards the members of the public of the given locality. The damage and injury claimed by the Municipality is damage and injury to public property. Any inconvenience or hardship that the Municipality is representing, is inconvenience and hardship to the members of the public of Monghyr. (Re. Sheffield and South Yorkshire Permanent Building Society—1889, 22 Queens Bench Division 420 p. 426).

Every legal person, therefore, has corresponding to it in the world of natural persons, certain agents or representatives by whom it acts and certain beneficiaries on whose behalf it exists, and fulfils its functions.

Authority of the agents and representatives of a Corporation, is therefore conferred, limited and determined not by the will of the principal but either by the wills of some human beings who are for this purpose identified in law with the Corporation or of the law itself. The Corporation is not only responsible for what its agents do but also for the manner in which they do it. Its liability is an instance of vicarious responsibility. It can be held liable for wrongful acts and its liability extends even to those cases in which malice, fraud or other wrongful motive or intent is a necessary element.

Corporations, no less than men, are within the reach of the arm of criminal law. They may be indicted or otherwise prosecuted for the breach of their statutory or common law duties and punished by way of fine or forfeiture.

A Corporation can sue for any tort in the same way as an individual except for torts of purely personal nature.

In this view of the matter we cannot agree with the contention of the learned lawyer for the Barauni Refinery that the Municipality cannot claim damages because the Municipality not only represents the entire public but a class of public also. After this we need not discuss the cases cited by the lawyer for the refinery which deal with the rules of interpretation as to how words used in the statute or notification under the statute have to be interpreted, and what meaning has to be given to them because we agree with the principle.

It is further urged by the learned lawyer for the Barauni Refinery that though the Commission under Clause VI of the terms of reference is competent to inquire into the extent of damages suffered by the public, it cannot recommend the restitution to be made to those who are adversely affected by it because restitution has to be limited to the actual loss and damages that arise naturally and directly from the act or omission complained of. This argument has no substance. The fundamental principle by which the Courts are guided in awarding damage is "restitution in integrum" which means that the law will endeavour so far as money can do it to place the injured person in the same situation or in

the position he occupied before the occurrence of the tort which adversely affects him.

As discussed earlier because of the pollution of water at Monghyr, the water supply to the town was suspended and the people suffered loss and injury and it is this loss or damage which is now being inquired into by the Commission. The Commission while making this inquiry into loss or damage suffered by the public can suggest to the Government what restitution can be made to those adversely affected as it directly arises from the act complained of.

The case of the State of Bihar is somewhat different from that of the Municipality. The Bihar Government while supporting the claim of the Monghyr Municipality has suggested some methods for permanent and independent supply of water in future to the people of Monghyr. It has not made any claim for itself. Since it is not claiming any damages we need not go into the question whether Bihar Government comes within the category of a legal entity.

After this we proceed to consider the claim of the Monghyr Municipality item by item.

The first claim of the Monghyr Municipality is for Rs. 167,000 consisting of 14 items in para 42 of the Memorandum. In order to prove the quantum of damages claimed under this head the Monghyr Municipality filed a number of vouchers MMD 29 to MMD 38 and relied upon BG 17 another voucher filed by the Bihar Government.

MMD 29 to 36 were filed on 15-10-1968 and MMD 37 and 38 were filed on 22-10-1968 and BG 17 was filed on 22-12-1968. MMD 29 to MMD 36 were not filed along with the memorandum but at a belated stage. The Chairman, Monghyr Municipality, filed an affidavit on 17-10-1968 giving the reasons for not filing them earlier. The learned lawyer for the Barauni Refinery first objected to the admission of those documents but subsequently agreed to have the documents admitted in evidence provided opportunity was given to the refinery to rebut them. The Commission accordingly admitted those documents on 17-10-1968. The Commission further admitted MMD 37, MMD 38 and BG 17 on 22-10-1968 and 23-12-1968 respectively. The Commission requested one of its Members (Shri K. R. Bhide) to go to Monghyr and ascertain about the facts of the work having been done. Shri Bhide after intimating the parties went to Monghyr and has submitted a report. Subsequently Shri Bhide filed a detailed report relating to each of the items claimed in para 42 of the Memorandum.

With regard to item No. 1, that is, cost of disilting settling tank, he has certified that the Monghyr Municipality has filed only one voucher showing an expense of Rs. 623.51 P. He has, therefore, recommended the claim of the Municipality to the extent of Rs. 623.51 P. under this Head.

The second item relates to the cost of resanding and overhauling sand filters. This claim is for Rs. 16,000. Shri Bhide has suggested that the claim of the Municipality to the extent of Rs. 15,321.72 P. on the basis of the vouchers filed by it has to be accepted.

With regard to item 3, the cost of resanding and renovating the mechanical filter, a claim for Rs. 43,000, Shri Bhide has recommended the claim to the extent of Rs. 22,338.54 P. only.

As regards item 4, his recommendation is to accept the claim to the extent of Rs. 116 only.

As regards items 5 and 6, he has said that these claims cannot be accepted as no vouchers have been filed.

As regards item 7, Shri Bhide has stated that this cleaning of distribution is unnecessary and what is required is merely periodic scouring of the distribution.

As regards item 8, he has recommended that expenditure of Rs. 492.75 P. has to be accepted.

As to the claim relating to item 9 for Rs. 11,000, he has said that the Municipality has not filed any vouchers but relies on the vouchers filed by the Bihar Government. BG 17 showing that water was supplied to the people of Monghyr by trucks which has cost the Government Rs. 3,244.17 P. and since the Bihar Government is not laying any claim to this amount and the vouchers relate to the Monghyr Municipality and PHED does the work for the Municipality and charges the same to its account, this claim has to be accepted.

As regards item 10, he has said that a sum of Rs. 139.05 P. has to be accepted as against the claim of Rs. 800.

With regard to item 11, cost of over-time and labour charges he has suggested that only Rs. 571.80 P. be accepted against Rs. 2,000 claimed.

With regard to item 12, he has said that a sum of Rs. 555 against the claim of Rs. 500 should be accepted as vouchers have been produced to justify this expenditure and the amount of Rs. 500 claimed is an approximate figure as mentioned in the Memorandum.

As regards item 13, the claim for the tube wells to be installed in the town, he has suggested that these tubewells were sunk and completed after the 10th March 1968 when the actual water supply to Monghyr was being resumed. The claim on this expenditure of Rs. 25,000 incurred, not being a loss or damage, he has said, that this should not be accepted.

As regards miscellaneous expenses under item 14, he has said that only Rs. 219 against Rs. 1,000 claimed should be accepted.

Thus in all he has recommended the claim of Municipality under para 42 of its memorandum to the extent of Rs. 43,621.60 P.

As against these claims under 14 heads preferred by the Municipality the refinery advocate in his written arguments at p. 1059 under F.43 has stated that items 4, 5, 6, 8, 9 and 11 alone can possibly be alleged to have caused and necessitated by the pollution of the river and in regard to these items alone restitution can be recommended provided that the expenditure on those have been proved and the claim for the remaining items has to be rejected.

As regards item 1, the main objection by the refinery is that since desilting is done every year and that is a normal operation required by the Municipality and as a matter of fact in the previous years also the Municipality had done desilting as a routine operation, such a claim not falling with the scope of restitution and which had to be done in any case without any pollution should not be accepted. We are not prepared to accept this argument of the learned lawyer. The fact that every year desilting has to be done as a routine would not be a good reason to throw out the claim of the Municipality for the simple reason that desilting is done normally after the monsoon whereas the present desilting is alleged to have been done before the monsoon and that was done because of the pollution. In this view of the matter, we accept the recommendation of Shri Bhide that the claim to the extent of Rs. 623.51 P. be accepted.

With regard to items 2 and 3, the contention of the refinery is that this claim has to be totally rejected because Municipality has filed Ex.MMD 29 series showing that it placed orders for the materials for sand and gravel, etc. on 28-12-1964 with Paterson Engineering Co. of India Private Limited along with two invoices. The first invoice is dated 28-12-1964 for Rs. 13,095.44 P. for the supply of gravels and the second invoice dated 15-3-1966 is for Rs. 14,045.20 P. From these documents—it is urged—it appears that the resanding and overhauling sand filter and mechanical filters were long overdue and the materials were ordered as far back as December 1964 and the Monghyr Municipality had requested the State Government for a grant of Rs. 1.5 lakhs for this purpose and the Government actually sanctioned Rs. 87,000 which the Municipality received by instalments and since all this happened long before the pollution such a claim cannot be accepted.

The Commission is not prepared to accept this argument of the learned lawyer for the Barauni Refinery for the simple reason that the refinery has taken this point of the Municipality asking for a grant of Rs. 1.5 lakhs and actually getting Rs. 87,000 from the Government of Bihar for resanding and over-hauling purposes for the first time in their written arguments and no material has been placed to support this point. Secondly even if this grant is there to the Municipality the moment it is granted it becomes the money of the Municipality. It is not correct that the first invoice is dated 28-12-1964 and the second one is dated 15-3-1966. As pointed out by Shri Bhide with which we agree the date 28-12-1964 is the date of the order for both the invoices, the first being a duplicate of the second. The learned lawyer for the refinery probably did not see this. We are sure if he had seen it he would not have advanced this argument. About the letter of SDO, Public Health Division, dated 12-10-1968 also there appears to be some misunderstanding. Shri Bhide has pointed out that the Public Health Division does the work on behalf of the Municipality as its agent and the amount of Rs. 9,243.10 shown in the letter is the amount spent in connection with the Ganga pollution. This amount has been spent for the Municipality by the Public Health Engineering Division. Shri Bhide has further pointed out that for every current financial year some amount is sanctioned by the Government of Bihar, Local Self Department, to the Municipality and the same is deposited to the credit of the Public Health Division and from out of this amount, the Public Health Engineering Department spends the amount. It is, therefore, the amount of the Municipality which is being spent. In this connection, Shri Bhide has referred to the letter No. 559 from Technical P.A. to the Chief Engineer dated 21-3-1968 to the Executive Officer, Monghyr Municipality, Monghyr (part of MMD 36) which shows that the Local Self Government of Bihar every year sanctions amount for the Municipality which is credited to the Executive Engineer, Public Health Division, Monghyr, by the Municipality and from out of these amounts work is carried out.

We next turn to the merits of the claim. So far as the claim for cost of resanding and overhauling is concerned, the Municipality has filed vouchers which go to prove that it spent Rs. 15,321.72 P. (MMD 36).

Shri Bhide after examining the vouchers has recommended that the claim of the Municipality to this expenditure has to be accepted.

So far as the third item of Rs. 43,000 is concerned, Shri Bhide after examining the vouchers (MMD 29 and 38) has stated that the claim to the extent of Rs. 22,338.54 only should be accepted under MMD 29 and the other claim of Rs. 25,194 has to be rejected as it has nothing to do with the loss or damage due to pollution.

As regards the question that since the orders placed for the supply of the material was much prior to the incident and the material was received earlier, it cannot be said that that was the material now used after the pollution. Shri Bhide has pointed out that since the case of the Municipality is that the material ordered earlier was lying with them and that was used in connection with the pollution and there is no rebuttal evidence on behalf of the refinery this claim to the extent of Rs. 22,338.54 P. has to be accepted.

As against the claim under item 4, the refinery accepts it to the extent of Rs. 120. Shri Bhide has accepted it only to the extent of Rs. 116.

As regards item 5, the refinery has urged that since the bills for the previous years have not been filed, it is not possible to know the excess consumption and so this claim should be rejected. Shri Bhide also has said so.

As regards item 6, the refinery's objection is that in the absence of any vouchers showing payment for the over-time, the claim cannot be accepted. Shri Bhide is also of the same view.

As regards item 7, the objection of the refinery is that it is in no way connected with the loss or damage due to pollution. Shri Bhide has said that this work is unnecessary and so this claim should not be accepted.

As regards item 8, the contention of the refinery is that there are no vouchers excepting a letter from Public Health Engineering Department dated 12-10-1968 to the Executive Officer, Municipality, which is only an information and so this claim cannot be accepted. Shri Bhide after examining the records has suggested that the claim to the extent of Rs. 492.75 P. should be accepted.

As regards item 9 it is urged by the refinery that this claim should be rejected because there is no voucher and the tankers were supplied by the Government of Bihar and the Municipality had not spent anything. Shri Bhide after considering the points has opined that the claim to the extent of Rs. 3,244.17 has to be accepted.

As regards items 10 and 12, the objection of the refinery is as these expenses do not come under loss and damage by pollution these, should not be given. Shri Bhide has said that since the Municipality has incurred this expenditure in connection with the pollution of the river Ganges, these items have to be accepted.

As regards item 11, what the refinery has said is that item 6 completely contradicts this claim and so this claim cannot be accepted. Shri Bhide after going through the vouchers has certified that the claim under this Head should be accepted to the extent of Rs. 571.80 P.

As regards item 13, the objection of the refinery is that this claim cannot be entertained as it is not connected with the pollution. Shri Bhide also has said so.

As regards item 14, the refinery says such a claim should not be accepted because it is not connected with the pollution. Shri Bhide has recommended this claim to the extent of Rs. 219 only.

We accept the recommendations of Shri Bhide on the above items.

The second item of damages claimed in para 43 does not require any consideration as it has nothing to do with any loss or damage caused by the pollution but is for any such emergency in future, such a claim cannot be entertained.

Para 44 also does not refer to any actual damage caused but it is a suggestion for future, this claim also cannot be entertained.

In para 45, the Municipality has claimed Rs. 5 lakhs by way of damages to be paid to the entire public of the Monghyr town consisting of 90,000 people for making arrangements to get water supply during the period from 3rd March to 9th March, 1968 at the rate of Rs. 5 per head. To this claim of the Monghyr Municipality, the Bihar Government has also stated in para 17 of its Memorandum that though the loss or damage caused to the public cannot be calculated exactly in terms of money but even if nominal figure is taken it should not be less than Rs. 2 per head for the period of interruption. It has, therefore, stated that the Municipality should be given Rs. 2 lakhs. The refinery has stated that such an omnibus claim on the basis of census figure on behalf of the public either at the rate of Rs. 5 or Rs. 2 per head cannot be accepted as it does not fall within the ambit of the terms of reference for the reason that the restitution is not to go to the public enmasse but only to that section of the public who has been adversely affected. In this connection, the attention of the Commission is drawn to BG 5.

The Commission is not prepared to accept the contention of the learned lawyer for the Barauni Refinery. As discussed above the Municipality represents not only the entire members of the public, but the class of public also. When it represents the class of public, how can it be said that as such it cannot claim damages for that class of public? The amount given to the Municipality will be held by it for the benefit of all those individual members of the public who have been adversely affected and have to be compensated for the damage caused to him or her as the case may be. It cannot be denied that from the 3rd March to 9th March, 1968, as the supply of water to the Monghyr town was suspended, people had to make alternative arrangements to get the supply of water from

the wells by engaging men or by adopting some other devices. Reading MM 8, MM 9, MM 27, MM 29, MM 30 and MM 37 together it can be said that each member of the public must have spent, for the arrangements to fetch water from distant places, at least Rs. 2 on an average. The Monghyr Municipality has claimed at the rate of Rs. 5 for the entire period of pollution. Whereas the Bihar Government has suggested at the rate of Rs. 2. As discussed above, Rs. 2 per head for the entire period would be very safe and reasonable amount.

Calculating thus, the loss suffered by the entire population can easily be estimated at Rs. 2 lakhs or so.

It cannot be said that the entire population of Monghyr as a body could have instituted a suit for damages under Order 1, Rule 8, C.P.C. The Municipality, therefore, which represents the public and whose duty it is to see to the supply of water has rightly taken up the cause of the public and thus can justly claim the said amount representing the public. The fact that there are drinking wells in the town or some wells were sunk as spoken to by the District Magistrate in BG 5 would not defeat this claim for the simple reason that from these wells also to get water the people would have to engage coolies or adopt some other methods. The Commission, therefore, recommends this claim to the Government.

Government of India should take suitable action to recover the amounts from the refinery and pay it to the Municipality for making payments to the members of the public of Monghyr who were adversely affected by the incident of 2nd and 3rd March, 1968, on account of procurement of water during that period or use it for other general public benefit.

Apart from the aforesaid claim of the Municipality, some individual members of the public have made individual claims.

MM4—Affidavit of Shri Brajendra Kumar, Advocate: That as a result of Ganga water pollution, I have to get a well dug costing Rs. 12,000. The refinery advocate has offered no comments on this claim. He has, however, shown another amount Rs. 50 as claim under this affidavit, which we are not able to trace anywhere in MM4. In regard to the well, we are not able to accept his claim for the reason that the affidavit does not disclose when the well was actually completed and whether the water of that well was made available for use during the 3rd to 9th March, 1968. Then again the digging of a well is a permanent arrangement for future and such a claim cannot be entertained.

MM8—Affidavit of Shri Madhav Prasad Tante: That because of the pollution of water nearby a lakh of people of Monghyr had to suffer for want of water and I had to cover miles to fetch water from the well and had to spend Rs. 2 per pitcher.

Against this claim, it is urged by the refinery lawyer that he has not stated for how many days he has spent Rs. 2 and for how many pitchers. His claim being vague, no calculations can be made. It is true that he has not stated for how many days he had to bring water and through how many pitchers but the fact remains that water supply was suspended from 3rd to 9th March, that is, for a period of 7 days and it cannot be denied that he must have made arrangements for getting water for those 6-7 days. Even if we calculate for one pitcher, he must have at least spent Rs. 14 for 7 days. To this extent his claim has to be admitted but since he is one of the citizens of Monghyr, and we while considering the claim of the Municipality under para 45 have accepted the claim of the entire citizens of Monghyr at Rs. 2 for the whole period, the claim of Shri Madhav Prasad Tante would be included in that and so his claim separately cannot be recommended.

MM 9—Affidavit of Shri Yogeshwar Prasad Singh: I had to bring water from a distant well at the rate of Rs. 2 per day for full ten days. The claim of Shri Yogeshwar Prasad Singh is not denied but since this claim is covered by the general claim under para 45, his claim separately cannot be recommended.

MM 24—Affidavit of Shri Sunder Soui, Secretary Fishermen's Co-operative Society: That due to this incident the fishing work had to be stopped for 15 days and the co-operative society has suffered a loss of Rs. 7,000. That due to this contaminated discharge from the refinery, the Ganga water was polluted and fish died and our business was affected.

In regard to this claim, it is contended by the refinery that in the absence of any material as to what was the account of out-turn and the amount unsold out of it, the claim on the basis of the affidavit cannot be accepted. We agree with the contention of the learned lawyer for the refinery. In our opinion, the affidavit filed is not sufficient to accept such a claim. The Society should have filed their records to show the out-turn and unsold quantity of those days and also of previous days to substantiate their claim. The affidavit does not state the limit, the extent and the area of fishing of the Society and the condition of the fishing area. In view of this, we cannot accept this claim. It is therefore rejected.

MM 27—Affidavit of Shri Choteylal Roy: I was greatly inconvenienced due to it and for ten days I had to bring water in rickshaw for personal use and for my cattle costing Rs. 5 daily, suffered a loss of Rs. 50. I had a cow, she died, I suffered a loss of Rs. 700—cost of the cow.

The refinery has objected to the claim for the death of the cow. As, however, there is no rebuttal to the affidavit filed, we have to accept this affidavit and recommend his claim to the extent of Rs. 700 to the Government. His other claim of Rs. 50 though not denied by the Barauni Refinery is covered by the general claim under para 45 of the Municipal Memorandum and so no separate compensation can be recommended to him.

MM 28—Affidavit of Shri Sukhdev Ram: For ten days I had to bring water in rickshaw at the rate of Rs. 5 per day. For this reason I suffered a loss of Rs. 50. I had two buffaloes which used to graze towards the bank of the Ganges, while the buffaloes were grazing in the noon they sat in the Ganga and after drinking water they began to dose and their stomach got distended. They passed loose stools and their skin also got peeled off. On the next day the two buffaloes became lifeless and died. I suffered a loss of Rs. 1,200 which was the price of two buffaloes.

The refinery has not commented on these claims of Shri Sukhdev Ram. As there is no rebuttal to the affidavit the claim for Rs. 1,200 resulting from the death of two buffaloes has to be accepted. We, therefore, recommend it to the Government. In regard to his claim for Rs. 50 he is one of the citizens and his claim is covered by the general claim recommended under para 45 of the Municipal Memorandum to the Government.

MM 29—Affidavit of Shri Sachidanand Singh: For ten days I had to bring water for my drinking purposes and my cattle at the rate of Rs. 5 per day. I have suffered a loss of Rs. 100. My two buffaloes used to go for grazing towards the bank of the Ganges. While they were grazing in the noon they sat in the Ganges for drinking water and immediately thereafter they began to dose and their stomach got distended. They got loose motions and their skin got peeled off. Next day they became lifeless and ultimately died. I suffered a loss of Rs. 2,000 which was the price of two buffaloes.

The refinery has accepted the claim of Rs. 100 for getting water but its objection to the claim of Rs. 2,000 is that since there is no report of the Veterinary Surgeon certifying the death of these animals, the claim is not admissible. It is a fact that there is no report of the Veterinary Surgeon but there is the affidavit of the person who has suffered this loss and this has not been rebutted. There is no reason to disbelieve his affidavit. The Commission, therefore, accepts this claim and recommends the same to the Government. As regards Shri Sachidanand's claim for Rs. 100 he is also one of the citizens whose claim would be covered by our recommendation under para 45 of the Municipal Memorandum. The Commission, cannot, therefore, recommend this claim separately.

MM 30—Affidavit of Shri Ramchander Prasad: That on 3-3-1968 in the morning I suddenly learnt that oily substance was floating on the surface of Ganges and due to which Monghyr Municipality had to stop the supply of drinking water. That since that date I had to bring water for drinking purposes from a well situated ... after paying at the rate of Rs. 2 per pitcher. Thus I spent Rs. 100 over water. That due to use of well water I and my children fell ill and had to spend Rs. 200 over the medical treatment.

The refinery has not referred to this claim as well as the claims of MM 31 to MM 37, most of them from the fishermen.

So far as the claim relates to bringing water is concerned, that will be covered under claim contained in para 45 of the Memorandum and no separate claim can be recommended. As regards the other claim which relates to the medical expenses, there is his affidavit which is unrebutted. We have to accept it and we recommend the claim of Rs. 200 to the Government.

MM 31—Affidavit of Shri Kaleshwar Sahni, Fisherman: That due to the discharge of oil the fishing had to be stopped for about ten days; that on the 3rd March 1968 itself about 20 maunds of fish were completely spoiled and rendered useless; that the fishermen of the co-operative society had to remain unemployed for ten days and thus they had to suffer further monetary loss approximately at the rate of Rs. 4,000 per day.

The affidavit filed is not clear to show the limit and the extent of the area of fishing where fishing is done and its condition, the number of fishermen that work, what are their daily or monthly wages, what is the price which each fish fetches, record to show how many fish are caught every day and how many had died. In the absence of such material it is very difficult

to assess the actual damage. This claim, therefore, cannot be accepted.

MM 32—Affidavit of Shri Pyar Sahni: From that day for ten days I was idle. I also saw on the surface of the river several fish lying dead and some were struggling for life. Water of the river was unpotable. I had a goat which had gone to the river for grazing, she drank the water and thereafter her belly was distended, she had loose motions and she died quickly. I have suffered a loss of Rs. 1,000.

Though he has said that he suffered a loss of Rs. 1,000 but he has not given the details of the items as to what was the price of the goat, how much loss he suffered by sitting idle for ten days. In the absence of such details his claim for Rs. 1,000 cannot be entertained.

MM 33—Affidavit of Shri Dhanik Sahni: My five brothers pursue the trade of catching fish on which we all live. On 3-3-1968 my brother Mahadev Sahai informed me that some kerosene like smell was coming from the surface of the river on account of which all his fish became useless. I also saw several fish lying dead floating and some were struggling for life. I suffered a loss of Rs. 1,200 thereby.

This claim also cannot be accepted as he has not given any details as to how many fish he had and out of them how many had died. He has also not shown what is the total mondage of fish and what price he would have received.

MM 34—Affidavit of Shri Kapildeo Narayan Singh: He has not claimed any damages but has suggested that a tube well costing Rs. 35,000 be sunk at the cost of the refinery or the Government. This cannot be entertained as it has nothing to do with loss or damage.

MM 35—Affidavit of Shri Bengali Sahni: I saw lot of dead fish floating on the surface and some were struggling for life. Our water supply was suspended and we had no work. I suffered a loss of Rs. 800 on account of the above.

This affidavit also does not contain any details and so this claim cannot be accepted.

MM 36—Affidavit of Shri Sukhdeo Sahni: My three maunds of fish became useless being spoilt by the kerosene oil like substance on the surface of the river causing me a loss of Rs. 750.

Though he has not given the price of each fish but he has said in all the loss of 3 maunds of fish would cost him Rs. 750. There is no reason to disbelieve him. His claim has to be accepted. We accordingly recommend it to the Government.

MM 37—Affidavit of Shri Shyamanand Singh: I had to bring water for drinking purposes from a well situated far away from my house by paying at the rate of Rs. 5 per pitcher. Thus I had to spend Rs. 300 over water. That my cow died after drinking Ganga water near Babu Ghat while grazing and thereby I sustained a loss of Rs. 700. That for obtaining water for drinking purposes I had to spend Rs. 2,000 for sinking tube well in my compound.

So far as the first claim is concerned, that is covered by the claim under para 45. Separate claim cannot be recommended. As to the second claim since the fact is not rebutted his affidavit has to be accepted and his claim for Rs. 700 has to be recommended. The third claim does not come under the category of loss or damage and so it cannot be entertained.

The proposal of the Monghyr Municipality in para 46 of its Memorandum and the proposals of the Bihar Government in paras 18 to 20 of its Memorandum are in the nature of suggestions to avoid and meet future happenings of this nature and are not connected with any loss or damage.

In the result, the recommendation of the Commission to the Government under the term of reference VI is as follows:

1. Under para 42 of the Municipal Memorandum, the claim for Rs. 43,621.60 P. is accepted and is recommended to the Government for consideration and necessary action.
2. The claims under paras 43 and 44 have not been accepted.
3. Under para 45 of the memorandum, the claim of the Municipality to the extent of Rs. 2 lakhs is accepted and the same is recommended to the Government for consideration and neeessary action.
4. Against the individual claims, we accept the claims of:

	Rs.
MM 27: for the loss of the cow	700.00
MM 28: for the loss of 2 buffaloes	1,200.00
MM 29: for the loss of two buffaloes	2,000.00
MM 30: to meet medical expenses	200.00
MM 36: value of 3 maunds of fish spoilt	750.00
MM 37: for the loss of a cow	700.00
	5,550.00

and recommend the same to the Government, and we reject the claims of:

	Rs.
MM 4: for the construction of a well	1,200.00
MM 24: loss to the fishing society	7,000.00
MM 31: loss due to smelling fish and inability to fish for 15 days	4,000.00
MM 32: details of loss suffered not given ...	1,000.00
MM 33: for spoilt fish, quantity not stated ...	1,200.00
MM 35: for spoilt fish, quantity not stated ...	500.00
	14,900.00

Barauni Refinery is responsible for the loss and damage caused to the people and the Municipality of Monghyr. It would be only just and proper in the circumstances of the case that the Government of India should find ways and means of compensating the Municipality and individuals who have suffered actual injury as indicated above.

For reference to Sri Bhide's report see appendix XIII.

SUMMARY OF THE FINDINGS REGARDING ITEM VI OF THE TERMS OF REFERENCE

1. The Barauni Refinery is responsible for the loss and damage caused to the Monghyr Municipality and the individuals—MM 27, MM 28, MM 29, MM 30, MM 36 and MM 37.

2. It is also responsible for the loss and damage caused to the public in general of the Monghyr town for making arrangements to get supply of water which was suspended from the 3rd March to the 9th March, 1968.

3. Government of India should find ways and means of compensating the Municipality, the citizens of Monghyr town and the individuals who have suffered actual injury as indicated earlier.

CHAPTER XX

ITEM VII OF THE TERMS OF REFERENCE

GENERALLY TO REPORT ON ANY OTHER MATTER THAT IS RELEVANT IN THE OPINION OF THE COMMISSION

With regard to this clause of reference the contention of the learned lawyer for the Refinery is that this clause was ultra vires the powers of the Government in that the Government had failed to specify the definite matter of public importance and had left it to the Commission to report generally on any other matter which in its opinion was relevant. In other words it is urged that this term of reference is vague in the sense that the Government which alone could form an opinion as to a definite matter of public importance has left this matter to be decided by the Commission without itself forming such an opinion. In this connection, our attention is drawn to the terms of reference before Modholkar Commission of Inquiry. The contention of the learned lawyer for the Monghyr Municipality and the Bihar Government is that this clause is not ultra vires the powers of the Government.

We agree with the contention of the lawyer for the refinery that under the Commissions of Inquiry Act a Commission can be set up for making an inquiry into a definite matter of public importance, *i.e.*, that the matter to be inquired into must be definite and it must also be of public importance. But in order to understand the clause of the reference we have to read the other terms of reference together. If all the terms of reference are read together it appears to us that what the Government means by the use of the words "any other relevant matters" is that it wants the Commission to report on some other aspects which are not particularised by the preceding terms of reference and which are relevant in its opinion.

We need not go into details and discuss this point and express our view because we do not feel the need to recommend any thing under this clause as what all we had to suggest we have done it under clause 8 of the reference. In the view we are taking we need not discuss the terms of Modholkar Commission of Inquiry or the other cases cited.

ANNEXURE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ANNEXURE

LIST OF APPENDICES

Appendix I: Resolution No. 22 (13)/68-OR, dated 20-4-68 constituting the Commission.

Appendix II: Resolution No. 22 (13)/68-OR, dated 22-5-68 amending term 3 of reference; regarding other refineries.

Appendix III: *Notifications*:

(i) Notification, dated 10-5-68 published in the Press.
(ii) Notification, dated 28-5-68 published in the Press.

Appendix IV: Newspapers in which Notification was published.

Appendix V: *Notices*:

(i) Notice, dated 10-5-68 issued to parties.
(ii) Notice, dated 28-5-68 issued to parties extending the date for submission of affidavits, etc.

Appendix VI: *Memos, issued by the Commission*:

(i) Memo. No. 1 requesting the Govt. to widen the terms of reference to cover other refineries.
(ii) Memo. No. 2: Information sought from G.M., Barauni Refinery in pursuance of notice issued under Rule 2 (1) (a) of the Rules under Central Commission of Inquiry (Procedure) Rules, 1960.
(iii) Memo. No. 3: Information sought from the President, Monghyr Municipality on Ganga Water Pollution in pursuance of notice issued under Rule 2(1)(a).
(iv) Memo. No. 4: Information sought from the Works Manager, Jamalpur Railway Workshop, Jamalpur, in pursuance of notice issued by the Commission under Rule 2(1)(a).

Appendix VII: *Affidavits and Petitions*:

(i) Affidavits received from Monghyr Municipality—(MM Series)
(ii) Petitions submitted by Monghyr Municipality—(MM Series).
(iii) Affidavits received from Govt. of Bihar (BG Series).
(iv) Petitions submitted by Govt. of Bihar—(BG Series).
(v) Affidavits received from Barauni Refinery.
(vi) Petitions submitted by Barauni Refinery.

Appendix VIII: *Documents*:

(i) Documents received from Monghyr Municipality (MMD Series).
(ii) Documents received from Bihar Govt. (BGD Series).
(iii) Documents received from Barauni Refinery (BRD Series).
(iv) Documents received from other (OD Series).
(v) Documents received from Commission's witnesses (CWD Series).

Appendix IX: List of Witnesses and the dates of recording their evidence.

Appendix X: Dates of Commission's visit to other refineries in the private and public sector inspection of Barauni Refinery, Monghyr and Jamalpur, Bata Shoe Co's Works at Mokamah, and inspection of effluent discharge point, pipeline and effluent channel of Barauni Refinery.

Appendix XI: Commission's sittings.

ANNEXURE—contd.

LIST OF APPENDICES—*contd.*

Appendix XII: Important petition and orders passed thereon by the Commission:

(i) Petition, dated 13-8-68 from Monghyr Municipality requesting Commission to call for report of Two-men Committee appointed by IOC to look into the question of ATF produced by Barauni Refinery.

(ii) Orders passed by the Commission on 13-9-68.

(iii) Petition, dated 14-4-69 from Barauni Refinery regarding terms of reference of the Commission effluent disposal scheme (BRD-39) and continuance of Shri K. R. Bhide as Member of the Commission.

(iv) Rejoinder petition, dated 15-4-69 from Monghyr Municipality in the above subject.

(v) Petition, dated 16-4-69 from Barauni Refinery in reply to petition, dated 15-4-69 filed by Monghyr Municipality.

(vi) Petition, dated 16-4-69 from Barauni Refinery as a supplement to, their petition, dated 14-4-69.

(vii) Orders passed by the Commission on 19-4-69.

Appendix XIII: Report of Shri K. R. Bhide on the question of damages.

Appendix XIV: List of jobs requiring immediate attention, attached to Shri K. R. Tuli's note, dated 27-9-67 on Sector VI. (BRD-28).

Appendix XV:

Ex. 1, Plate 1, dated 4-3-1968
Ex. 4, Plate 4, dated 4-3-1968
Ex. 5, Plate 5, dated 4-3-1968

} Ref. Chapter VII (P. 36).

APPENDIX I

(To be Published in the Gazette of India, Part I, Section I)

GOVERNMENT OF INDIA

MINISTRY OF PETROLEUM AND CHEMICALS

(DEPARTMENT OF PETROLEUM)

New Delhi, the 20th April, 1968

31st Chaitra, 1890(S)

RESOLUTION

No. 22(13)/68-*OR*—The Government of India have decided to set up a Commission under the Commissions of Inquiry Act, 1952, consisting of the following:—

Chairman

Shri Manohar Pershad.

Members

Shri N. V. Modak.

Shri K. R. Bhide.

Dr. M. G. Krishna.

2. The terms of reference of the Commission will be as follows:

(i) to determine the correct facts of the contamination with oil of the river Ganga near and downstream of the Barauni Refinery during the last week of February, (or earlier) and first week of March, 1968;

(ii) to determine to what extent the Barauni Refinery has been responsible for the happenings;

(iii) to recommend the steps that must be taken to prevent the recurrence of such happenings in the future;

(iv) to advise on whether there has been any negligence or carelessness on the part of the Refinery management and staff in the discharge of their prescribed duties;

(v) arising out of (iv) to recommend the further action, if any, that must be taken;

(vi) to report on the loss or damage to the public caused by the pollution of the river and to recommend what, if any, restitution the Indian Oil Corporation should make in that connection to those adversely affected;

(vii) generally, to report on any other matter that is relevant, in the opinion of the Commission.

3. The Commission will be assisted by special consultants wherever necessary and desired by it.

4. The Commission will devise its own procedures. It may call for such information and take such evidence as it may consider necessary. The Ministries/Department of Government of India will furnish such information and render such assistance as may be required by the Commission. The Government of India trust that the Government of Bihar and all others concerned will extend their fullest cooperation and assistance to the Commission.

5. The Commission will submit its report within a period of 3 months.

ORDER

Ordered that the Resolution be published in the Gazette of India, Part I, Section I.

Ordered also that a copy of the Resolution be communicated to all Ministries/Departments of Government of India, Government of Bihar and all others concerned.

Sd. E. N. MANGATRAI

Special Secretary to the Government of India

L/B(D)173MofPCM&M—10

APPENDIX II

(To be Published in the Gazette of India, Part I, Section I)

GOVERNMENT OF INDIA

MINISTRY OF PETROLEUM AND CHEMICALS

(DEPARTMENT OF PETROLEUM)

New Delhi, the 22nd May, 1968

RESOLUTION

No. 22(13)/68-*OR*—In partial modification of Ministry of Petroleum and Chemicals (Department of Petroleum) Resolution No. 22(13)/68-OR dated the 20th April, 1968, para 2(iii) of the same is amended to read as under:—

"To recommend the steps that must be taken to prevent the recurrence of such happenings in refineries in future".

ORDER

Ordered that the Resolution be published in the Gazette of India; Part I, Section I.

Ordered, further, that a copy of the Resolution be communicated to all Ministries/Departments of Government of India, Government of Bihar and all others concerned.

Sd. M. V. RAJWADE

Joint Secretary to the Government of India

APPENDIX III (i)

OFFICE OF THE COMMISSION OF INQUIRY

New Delhi, the 10th May, 1968

NOTIFICATION

F. 27(2)/68-*OR.*—Whereas by Ministry of Petroleum and Chemicals, Notification No. 22 (13)/68-OR, dated April 20, 1968, the Government of India appointed a Commission of Inquiry to enquire into the water pollution of river Ganges near and downstream of Barauni Refinery during February-March, 1968, and allied matters.

Now, therefore, this Notification is issued, by and under the orders of the Chairman of the Commission inviting all persons acquainted with the subject matter of inquiry to furnish to the Commission, affidavits containing a statement of facts on the said subject matter, as to which the deponent is competent to depose. Such affidavits must be strictly confined to the said subject matter only and the statements of fact to be set forth in the affidavits must be expressed to be related to particular items of the same. Such affidavits must be properly verified in the following manner, namely "That the statements in paragraphs ..... and ..... of the foregoing affidavits are true to my knowledge" and in case the statements are derived from information received, "that the statement in paragraphs..... and..... are based on information received by me from (naming the informant) residing at ..... and believed by me to be true".

The original affidavits with four copies of each must be filed on any working day between the hours of 10.15 A.M. and 5.15 P.M., or sent by registered post, at the office of the Commission at Room No. 227, "A" Wing, II Floor, Shastri Bhavan, Dr. Rajendra Prasad Road, New Delhi, I *on or before June* 7, 1968.

Affidavits not verified in the manner indicated above or not filed within the date or manner specified above, will not be taken into consideration by the Commission.

By order
Sd. I. M. SAHAI, *I.A.S.,*
For and on behalf of *the Chairman*
Commission of Inquiry

APPENDIX III (ii)

OFFICE OF THE COMMISSION OF INQUIRY

*Room No. 227, Wing "A", II Floor, Shastri Bhavan, Dr. Rajendra Prasad Road, New Delhi-*1.

28th May, 1968

NOTIFICATION

No. 27(2)/68-*OR.*—In partial modification of the Notification dated 10th May, 1968, issued by the Commission in connection with the proposed enquiry regarding the water pollution of the River Ganges near and downstream of Barauni Oil Refinery during February-March, 1968 and allied matters, the Chairman hereby extends the time for furnishing affidavits containing statement of facts etc. upto the 23rd June, 1968 and makes the following amendments, namely:—

In the said notification, for the words and figures on or before June 7, 1968, the words and figures "on or before June 23, 1968" shall be substituted.

By order
Sd. N. KRISHNAMURTY
Secretary
For and on behalf of *the Chairman*
Commission of Inquiry

APPENDIX IV

LIST OF NEWSPAPERS IN WHICH NOTIFICATION WAS PUBLISHED

Serial No.	Name of the Newspaper	Place	Language	Date of publication of notification and amendment
1	2	3	4	5
1	Indian Express	New Delhi	English	22-5-68 & 30-5-68
2	Hindustan Times	,,	,,	5-6-1968
3	Times of India	,,	,,	15-5-68 & 30-5-68
4	Statesman	,,	,,	15-5-68 & 31-5-68
5	Patriot	,,	,,	21-5-68 & 30-5-68
6	National Herald	,,	,,	13-5-68
7	Hindustan Standard	Calcutta	,,	16-6-68
8	Navbharat Times	New Delhi	Hindi	5-6-68
9	Hindustan	,,	,,	5-6-68
10	Vishwamitra	Patna	,,	4-6-68
11	Indian Nation	,,	English	15-5-68 6-6-68 9-6-68
12	Aryavarta	,,	Hindi	15-5-68 and 5-6-68
13	Pradeep	,,	,,	4-6-68, 4-6-68
14	Searchlight	,,	English	21-5-68 1-6-68 7-6-68 7-6-68

APPENDIX V (i)

OFFICE OF THE COMMISSION OF INQUIRY

New Delhi, the 10th May, 1968

NOTICE

To

1. The General Manager,
   Barauni Refinery,
   Barauni, Bihar.
2. Chairman,
   Municipal Board,
   Monghyr, Bihar.
3. Works Manager,
   Railway Workshops,
   Jamalpur (E.R.),
   Distt. Monghyr (Bihar).

F. 27(2)/68-*OR*—Whereas by Ministry of Petroleum and Chemicals' Notification No. 22 (13)/68-OR dated the April 20, 1968, the Govt. of India appointed a Commission of Inquiry to enquire into the water pollution of river Ganges near and downstream of Barauni Refinery during February-March, 1968 and allied matters.

2. Now, therefore, this notice is issued by and under the orders of the Chairman of the Commission, directing you to furnish to the Commission affidavits containing a statement of facts relating to the matters specified in the Commission's Memorandum enclosed herewith, as to which you are competent to depose. Such affidavits must be properly verified in the following manner, namely "that the statements in paragraphs ..... and ..... of the foregoing affidavits are true to my knowledge" and in case the statements are derived from information received, "that the statement in paragraphs..... and ..... are based on information received by me from ..... (Naming the informant) residing at ..... and believed by me to be true".

3. You shall also furnish to the Commission alongwith the above statement, a list of the documents, if any, on which you propose to rely and forward to the Commission, wherever practicable, the originals or true copies of such of the documents as may be in your possession or power and shall state the name and address of the person from whom the remaining documents may be obtained.

4. The original affidavits with four copies of each must be filed on any working day between the hours of 10.15 A.M. and 5.15 P.M. or sent by registered post, to the office of the Commission at Room No. 227, "A" Wing, II Floor, Shastri Bhavan, Dr. Rajindra Prasad Road, New Delhi-1 on or before June 7, 1968.

Affidavits not verified in the manner indicated above or not filed within the date or manner specified above, will not be taken into consideration by the Commission.

By order
Sd. I. M. SAHAI
For and on behalf of *the Chairman*
Commission of Inquiry

APPENDIX V (ii)

OFFICE OF THE COMMISSION OF INQUIRY

Room No. 223, "A" Wing, II Floor, Shastri Bhavan, New Delhi, 28th May 1968

NOTICE

1. General Manager,
   Barauni Refinery,
   Barauni, Bihar.
2. Works Manager,
   Railway Workshops,
   Jamalpur (E.R.),
   Bihar.
3. Chairman,
   Municipal Board,
   Monghyr, Bihar.

No. 27(2)/68-*OR*—In partial modification of the Notice dated 10th May, 1968, issued by the Commission in connection with the proposed enquiry regarding the water pollution of the river Ganges near and downstream of Barauni Oil Refinery during February-March, 1968 and allied matters, the Chairman hereby extends the time for furnishing affidavits containing statement of facts, documents etc. upto the 23rd June, 1968 and make the following amendments; namely:—

In the said notice for the words and figures "on and before June 7, 1968" the words and figures "on or before June 23, 1968" shall be substituted.

By order
Sd. N. KRISHNAMURTY
Secretary
For and on behalf of *the Chairman*
Commission of Inquiry

APPENDIX VI (i)

COMMISSION OF INQUIRY ON GANGES WATER POLLUTION NEAR MONGHYR

MEMO. NO. 1

Commission feels that it is necessary that the scope of term No. 3 has to be widened so as to include other refineries in future. The Commission, therefore, suggests the following term to be in place of the previous one.

"To recommend the steps that must be taken to prevent the recurrence of such happenings in refineries in future".

Sd. MANOHAR PERSHAD
9-5-68

Sd. N. V. MODAK
9-5-68

Sd. M. G. KRISHNA
9-5-68

Sd. K. R. BHIDE
9-5-68

APPENDIX VI (ii)

COMMISSION OF INQUIRY ON GANGES WATER POLLUTION NEAR MONGHYR

MEMO. NO. 2

SUBJECT:—*Information sought from General Manager, Barauni Refinery in pursuance of notice issued by the Commission under Rule 2 (i)(a) of the Rules under Central Commissions of Inquiry (Procedure) Rules,* 1960.

1. G.M.'s account of the incident of pollution of Ganga river involving accumulation of oil/oil products on the river near Monghyr and the fire on river waters.

2. A detailed lay-out of the complete effluent and waste disposal system of Barauni Refinery, as originally designed and as finally functioning before and at the time of the incident.

2.1. Full details of the methods adopted in the refinery to treat the refinery wastes before discharge into the river.

3. Detailed analysis and inspection reports of refinery wastes (including BOD values), before and after treatment from different units and of the final effluent entering the river.

4. Retention period in the oil separators and in the stabilization ponds.

5. Details of the method of disposal of the sludge and the intervals at which sludge is removed.

6. Standards and specifications being followed with regard to waste treatment and disposal systems.

7. Whether any emergency tanks or other systems are provided in the refinery and if so, how frequently they have been used and details of some case histories.

8. Total daily flows of the effluent and their properties that were being discharged into the system during the three months prior to the incident.

9. A detailed account of the preventive measures taken by the refinery after the incident, to avoid pollution of the river waters.

10. Detailed drawings, with dimensions, showing the location of the river front and sand beds in relation to the refinery premises and effluent discharge pipe, for each year, if possible since the Barauni Refinery started production till the incident.

Sd. MANOHAR PERSHAD
9-5-68

APPENDIX VI (iii)

COMMISSION OF INQUIRY ON GANGES WATER POLLUTION NEAR MONGHYR

MEMO NO. 3

SUBJECT:—*Information sought from the President, Monghyr Municipality on Ganga water pollution in pursuance of notice issued by the Commission under Rule 2 (i)(a) of the Rules under Central Commissions of Inquiry (Procedure) Rules,* 1960.

1. His account of the incident involving pollution of Ganga river water near Monghyr.

2. When did he or the people of Monghyr first notice the pollution and how?

3. When did he or the people of Monghyr first notice fire on Ganga river waters and their account of how the fire might have occurred?

4. The duration over which potable water supply to Monghyr town was stopped as a result of the pollution incident.

5. Was there any damage to people or cattle or property due to supply of polluted water or stoppage of water supply?

Sd. MANOHAR PERSHAD
Chairman
9-5-68

APPENDIX VI (iv)

COMMISSION OF INQUIRY ON GANGES WATER POLLUTION NEAR MONGHYR

MEMO NO. 4

SUBJECT:—*Information sought from the Works Manager, Jamalpur Railway Workshops, Jamalpur on Ganga water pollution in pursuance of notice issued by the Commission under Rule 2 (i)(a) of the Rules under Central Commissions of Inquiry (Procedure) Rules,* 1960.

1. His account of the incident involving pollution of Ganga river water near Monghyr.

2. When did he or the people of Jamalpur first notice the pollution and how?

3. When did he or the people of Jamalpur first notice fire on Ganga river waters and their account of how the fire might have occurred?

4. The duration over which potable water supply to Jamalpur town was stopped as a result of the pollution incident.

5. Was there any damage to people or cattle or property due to supply of polluted water or stoppage of water supply?

6. Analysis and inspection reports, with particular reference to oil and grease content, of water, before and after treatment, supplied to Jamalpur workshops and Townships.

Sd. MANOHAR PERSHAD
Chairman
9-5-68

APPENDIX VII (i)

AFFIDAVITS RECEIVED FROM MONGHYR MUNICIPALITY

Exhibit No.	Subject	Date of Affidavit	Date of Receipt
MM1	Shri Profulla Kumar Misra, Chairman, M.M.	20-6-68	22-6-68
MM2	Shri Bachha Prasad, Executive Officer, M.M.	20-6-68	,,
MM3	Shri Brajendra Narain Singh, Supdt., Water Works, Monghyr Municipality	15-6-68	,,
MM4	Shri Brajendra Kumar, Advocate, M. Municipality	20-6-68	,,
MM5	Shri Maheswari Prasad, Inspector of Factories, Monghyr Circle, Monghyr	20-6-68	,,
MM6	Shri Indradeo Pandey, Head of the Deptt. of Chemistry, R.D. & D.J. College, Monghyr	20-6-68	,,
MM7	Shri Kashi Prasad, Press Correspondent, Searchlight, Patna	20-6-68	,,
MM8	Shri Madhav Prasad Tanti, Press Correspondent, Hindustan Samachar	20-6-68	,,
MM9	Shri Yogeshwar Prasad Singh, Teacher, Local Town School & President, Teachers' Assn., Monghyr	18-6-68	,, ,,
MM10	Shri Baijnath Mahton, Pump Attendant, Kasturba Water Works, Monghyr	18-6-68	,,
MM11	Shri Jogeswar Yadav, Pump Attendant, Kasturba	15-6-68	,,
MM12	Shri Ghoghan Yadav, Pump Khalasi, Kasturba	18-6-68	,,
MM13	Shri Brahmadev Paswan, Pump Khalasi, Kasturba	19-6-68	,,
MM14	Shri Anant Lal, Pump Khalasi, Kasturba	18-6-68	,,
MM15	Shri Mohd. Washim, Pump Attendant, Kasturba	15-6-68	,,
MM16	Shri Ram Balak Singh, Filter Attendant, Kasturba	18-6-68	,,
MM17	Shri Gulo Mistry, Mistry, Kasturba	18-6-68	,,
MM18	Shri Rajendra Prasad, Clerk-cum-Store Keeper, Kasturba Water Works, Monghyr ..	18-6-68	,,
MM19	Shri Upendra Prasad Verma, Meter Reader, Kasturba	18-6-68	,,
MM20	Shri Hari Prasad Varma, Member, Monghyr Municipal Board, Monghyr	15-6-68	,,
MM21	Shri Bhothar Das, Municipal Councillor, Monghyr	15-6-68	,,
MM22	Shri Dr. Ram Prasad Rai, Member, Municipal Board, Monghyr	15-6-68	,,
MM23	Shri Asgar Ali, Sub-Officer, Fire Station, Monghyr	20-6-68	,,
MM24	Shri Sundar Sahni, Secretary, Fishermen's Coop. Society	20-6-68	,,
MM25	Shri Sadanand Trivedi, Officer-in-Charge, Town Police Station, Monghyr	20-6-68	,,
MM26	Shri Binayak Choudhary, Asstt. Manager, Central Consumers Cooperative Store, Monghyr	20-6-68	,,
MM27	Shri Chhotelal Rai, Citizen, Resident of Kawamaidan, Monghyr	19-6-68	,,
MM28	Shri Sukh Deo Ram, Citizen, Resident of Laloopokher, Monghyr	20-6-68	,,
MM29	Shri Sachidanand Singh, Citizen, Resident of Laloopokher, Monghyr	20-6-68	,,
MM30	Shri Ramchandra Prasad, Advocate, Monghyr Town	6-7-68	8-7-68
MM31	Shri Kaleshwar Sahni, Fisherman, Resident of village Bagdov, Monghyr	2-7-68	,,
MM32	Shri Pyare Sahni, Fisherman, Resident of village Laloopokher, Monghyr	2-7-68	,,
MM33	Shri Dhanik Sahni, Fisherman, Resident of village Laloopokher, Monghyr	3-7-68	,,
MM34	Shri Kapildeo Narain Singh, Principal, RD & DJ College, Monghyr	4-7-68	,,
MM35	Shri Bangali Sahni, Fisherman, Resident of village Laloopokher, Monghyr	2-7-68	,,
MM36	Shri Sukhdeo Sahni, Fisherman, Resident of village Laloopokher, Monghyr	2-7-68	,,
MM37	Shri Shyamanand Singh, Lecturer, Monghyr Town	6-7-68	,,

APPENDIX VII (ii)

PETITIONS FILED BY MONGHYR MUNICIPALITY

Serial No.	Subject	Date of Receipt	Date of Disposal
1	Petition dated 13-8-68 requesting the Commission to call for some more documents/witnesses	13-8-68	13-8-68
2	Counter petition dated 23-8-68 filed by Chairman Monghyr Municipality	28-8-68	
3	Rejoinder petition dated 23-8-68 regarding Refinery claiming privilege for not filing documents	2-9-68	5-9-68
4	Petition dated 5-9-68 requesting the Commission to call for data on effluent discharge of Barauni Refinery; minimum discharge of river Ganges during Jan.-February and March, 1968 ..	5-9-68	5-9-68
5	Petition dated 6-9-68 requesting the Commission to call two more witnesses—S/Shri M. K. Roy and Sadanand Trivedi	6-9-68	6-9-68
6	Petition dated 20-9-68 regarding examination of witnesses by the Commission	20-9-68	20-9-68
7	Petition dated 20-9-68 regarding letter No. H/S9/102/62-PHE 277 dated 9-4-62 for approval of scheme for effluent disposal	20-9-68	20-9-68
8	Petition dated 21-9-68 regarding summoning of Soviet Experts	21-9-68	21-9-68
9	Petition dated 21-9-68 calling for log-book of OM & S (Despatch)	21-9-68	21-9-68
10	Petition dated 22-9-68 calling for certain drawings etc.	22-9-68	22-9-68
11	Petition dated 22-9-68 calling for instruction books of OM&S (R & D) containing entries regarding AFT discharged	22-9-68	22-9-68
12	Petition dated 15-10-68 regarding copies of analysis report on samples, temperature chart etc.	15-10-68	15-10-68
13	Petition dated 18-10-68 requesting Commission to call for information on flow rates of water in Ganges, from Ganga Discharge circle	19-10-68	20-10-68
14	Petition dated 23-10-68 requesting Commission to call for log-sheets of AVU I and II from Barauni Refinery	23-10-68	23-10-68
15	Petition dated 15-12-68 requesting that Barauni Refinery may be asked to produce original letter dated 12-1-68 written by Shri Y. D. Puri	15-12-68	15-12-68
16	Petition dated 15-12-68 requesting that a local inspection of existing channel be made and Barauni Refinery ordered not to change the existing features of the channel ..	15-12-68	15-12-68
17	Petition dated 19-12-68 requesting that Refinery be asked to file stock register of water Finding Paste and Dip Tape, purchase invoice etc. and to produce the dip tape in use on 12-1-68 by operator OMS (R) of Sector 6	19-12-68	19-12-68
18	Petition dated 19-12-68 requesting that the Refinery be asked to produce Log-books of Sector 6 by operators of Power & Utility, Log-book of Water Supply maintained by Shift Incharge Sector 7, Oil Dip Register Sector 6 and other log-books for the period January, 66 to August, 67 and also requesting that Municipality's right to cross-examine Shri Puri at a later stage be reserved	19-12-68	19-12-68
19	Petition dated 23-12-68 regarding permission sought by Barauni Refinery for digging of channel etc.	23-12-68	23-12-68
20	Petition dated 24-12-68 regarding copies of vouchers submitted by the Municipality to the Commission in reply to the petition filed by Barauni Refinery	24-12-68	24-12-68
21	Petition dated 17-3-69 from Advocate, Monghyr Municipality requesting that in the absence of Shri P. K. Misra, sufficient time may be given for submission of written arguments ..	17-3-69	19-3-69
22	Rejoinder petition dated 15-4-69 regarding BRD-39 and continuance of Shri K. R. Bhide as Member of the Commission	16-4-69	19-4-69

APPENDIX VII (iii)
AFFIDAVITS RECEIVED FROM BIHAR GOVERNMENT

Exhibit No.	Subject	Date of Affidavit	Date of Receipt
BG-1	Shri Harnandan Prasad—Secretary, L.S.G. Deptt., Patna	8-7-1968	15-7-1968
BG-2	Shri Brajendra Pati Tripathy—Addl. Chief Engineer, P.H.E.D., Patna	8-7-1968	15-7-1968
BG-3	Shri R.K. Dubey—Superintending Engineer (Mechanical), P.H.E.D., Patna	8-7-1968	15-7-1968
BG-4	Shri Lal Bihari Lal —Superintending Engineer (Mechanical), P.H.E.D., Muzaffarpur ..	8-7-1968	15-7-1968
BG-5	Shri Vinod Kumar—District Magistrate, Monghyr	8-7-1968	15-7-1968
BG-6	Shri Rambadan Kumar—Executive Engineer, P.H.E.D., Monghyr	6-7-1968	15-7-1968
BG-7	Dr. R.N. Prasad—Civil Surgeon & S.E.M.O., Monghyr	8-7-1968	15-7-1968
BG-8	Dr. Amareswar Prasad—Dy. Supdt., Sadar Hospital, Monghyr	8-7-1968	15-7-1968
BG-9	Shri S.S. Prasad, S.D.O., P.H.E.D., Monghyr	8-7-1968	15-7-1968
BG-10	Shri Sarju Paswan, Resident of Chakwali village, P.S. Begusarai, Monghyr	10-7-1968	22-7-1968
BG-11	Shri Harballabh Singh, Resident of village Maranchi, P.S. Mokamah, Distt. Patna ..	10-7-1968	22-7-1968
BG-12	Shri Rampadarath Singh, Resident of village Kasbey, P.S. Barauni, Distt. Monghyr ..	10-7-1968	22-7-1968
BG-13	Shri Ramchandra Singh, Resident of village Mahna, P.S. Barauni, Distt. Monghyr ..	10-7-1968	22-7-1968
BG-14	Shri Gita Singh, Resident of village Maranchi, P.S. Mokamah, Distt. Patna	10-7-1968	22-7-1968
BG-15	Shri Ram Padarath Singh, Resident of village Jagatpura, P.S. Begusarai,, Monghyr ..	12-7-1968	22-7-1968

APPENDIX VII (iv)
PETITIONS FIELD BY BIHAR GOVERNMENT

Serial No.	Subject	Date of Receipt	Date of Disposal
1	Petition dated 18-10-68 from Bihar Government regarding acceptance of vouchers submitted by Monghyr Municipality	18-10-68	19-10-68
2	Petition dated 21-12-68 from Bihar Government filing therewith original vouchers for Rs. 3,244·17 submitted by the P.H.E. Deptt., Bihar	22-12-68	27-12-68

APPENDIX VII (v)
AFFIDAVITS/INFORMATION FILED BY BARAUNI REFINERY

Exhibit No.	Subject	Date of receipt
R-1	Affidavit from Maj. Gen. C.N. Das, General Manager, Barauni Refinery dated 16-6-68 along with information called for in Memo. No. 2	21-6-68
R-2	Supplementary data/material furnished by IOC (RD) with reference to letter No. 27(2)/68-OR dated 22-5-1968 regarding Dimensions of channel cut out in the sand bed by effluent stream, at the time of the incident, from the refinery till the channel joined the Ganga river	21-6-68
	The contour of the channel; levels at different points. Clear photographs of the channel taken from top, at its narrowest, widest and wherever pools or ponds are formed. Depth of channel at various points. Daily quantities and properties of effluent that was being discharged into the channel during three months immediately before the incident.	

APPENDX VII (v)—*contd.*

AFFIDAVITS/INFORMATION FILED BY BARAUNI REFINERY—contd.

Serial No.	Subject	Date of Receipt
R-3	Information furnished by IOC (RD) as directed by the Commission on 9-5-68 regarding .. .. Report of the Sewage & Disposal for Barauni Refinery by N. Sanyal. Design specifications of the effluent going into the effluent system. Map showing the course of river Ganga near Barauni. Development plan and job schedule; General lay-out of the Refinery and the adjoining structures	15-5-1968
R-4	Affidavit filed by Maj. Gen. C.N. Das, General Manager, Barauni Refinery on 13-8-68 claiming privilege	13-8-68
R-6	Counter affidavit dated 23-8-68 filed by Shri R.R. Verma, Chief Process Engineer on behalf of General Manager, Barauni Refinery	26-8-68
R-15	Affidavit dated 1-4-69 filed by Mr. G. S. Harnal, DGM (T) giving replies to the questions of the Commission	5-4-69
R-16	Affidavit dated 2-4-69 filed by Mr. C.D. Ayyar, Chief Electrical Engineer, Barauni Refinery giving replies to the questions of the Commission	7-4-69

APPENDIX VII (vi)

PETITIONS FILED BY BARAUNI REFINERY

Serial No.	Subject	Date of Receipt	Date of Disposal
1	Petition dated 14-8-68 filed by Shri K.B. Verma, claiming privilege	14-8-68	Not pressed
2	Petition dated 21-9-68 giving information that Russian experts mentioned in the petition of Monghyr Municipality have left the country	21-9-68	21-9-68
3	Rejoinder petition dated 16-10-68 to petition filed by Monghyr Municipality regarding acceptance of vouchers in respect of expenditure incurred by it	16-10-68	16-10-68
4	Petition dated 22-12-68 requesting for permission to excavate a temporary channel to take effluent to the Ganges stream, for purpose of complete mixing	22-12-68	23-12-68
5	Petition dated 23-12-68 filed by B.R. stating that a large number of vouchers have been filed by Monghyr Municipality subsequently and that they should not be taken into evidence, and that Municipality may be directed to furnish copies of all the documents to the Refinery ..	23-12-68	23-12-68
6	Petition dated 23-12-68 filed by Barauni Refinery regarding non-acceptance of vouchers filed by Govt. of Bihar with their petition dated 21-12-68	23-12-68	27-12-68
7	Letter dated 8-3-69 from General Manager, Barauni Refinery stating that hearing may be completed before 22-3-1969	10-3-69	19-3-69
8	Letter dated 7-3-69 from Barauni Refinery stating that Shri Harnal has been discharged from Hospital and he may be examined after 31-3-69	11-3-69	19-3-69
9	Petition dated 18-3-69 filed by Barauni Refinery requesting the Commission to examine S/Shri Harnal and Ayyar	18-3-69	19-3-69
10	Petition dated 14-4-69 filed by Barauni Refinery regarding the terms of reference of the Commission, BRD-39 and the continuance of Shri K.R. Bhide as Member of the Commission ..	15-4-69	19-4-69
11	Petition dated 16-4-69 from Barauni Refinery in reply to rejoinder filed by Monghyr Municipality on 14-4-69	16-4-69	19-4-69
12	Supplementary petition dated 16-4-1969 to Barauni Refinery's petition dated 14-4-1969 regarding terms of reference BRD-39 etc.	16-4-69	19-4-69

APPENDIX VIII (i)

DOCUMENTS RECEIVED FROM MONGHYR MUNICIPALITY

Exhibit No.		Date of Receipt
MM D1	Copy of letter No. 47/JK dated 2-3-1968 from Executive Officer, Monghyr Municipality to S.E.M.O. Civil Surgeon, Monghyr	22-6-68
MM D2	Report of Prof. I.D. Pandey, Head of the Department of Chemistry, R.D. & D.J. College, Monghyr dated 3-3-1968	22-6-68
MM D3	Copy of wire to Director of Public Health, Patna and L.S.C. Minister by Chairman, Municipal Board, Monghyr	22-6-68
MM D4	Proceedings of emergent meeting of the Municipal Board, held on 3-3-1968	22-6-68
MM D5	Joint note of Executive Officer and Superintendent Water Works of Monghyr Municipality dated 3-3-1968	22-6-68
MM D6	Letter No. 59/J.K. dated 7-3-1968 from the Executive Officer, Monghyr to the District Magistrate, Monghyr	22-6-68
MM D7	Letter No. 62/ww dated 9-3-68 from the Chairman, Monghyr Municipality to the Additional Chief Engineer, P.H.E.D. Patna	22-6-68
MM D8	Copy of telegram to Smt. Indira Gandhi, Prime Minister of India, New Delhi	22-6-68
MM D9	Letter No. C-s/920 dated 4-3-1968 from Mr. S.M. Hashim, Health Minister, Bihar, Patna to the Chief Minister	22-6-68
MM D10	Letter No. 42/H dated 6-3-68 from Dr. B.P. Sinha, D.M.O. Health, Monghyr to Director of Public Health, Patna	22-6-68
MM D11	Letter No. 60/JK from Executive Officer, Monghyr Municipal Board to Executive Engineerr, P.H. E.D., Monghyr	22-6-68
MM D12	Letter No. 1294/C from District Magistrate, Monghyr to Chairman, Municipal Board, Monghyr	22-6-68
MM D13	Report of Superintendent of Water Works, Monghyr dated 9-3-1968	22-6-68
MM D14	Letter No. 68/JK dated 10-3-68 from Chairman, Municipal Board, Monghyr to Chief Secretary, Government of Bihar, Patna	22-6-68
MM D15	Letter No. 298 dated 7-3-68 from Chairman, Monghyr Municipality to Ashoka Mehta, Minister of Petroleum and Chemicals, Government of India, New Delhi	22-6-68
MM D16	Proceedings of the emergent meeting dated 19-3-68 of the Monghyr Municipal Board	22-6-68
MM D17	Memo. No. 285 dated 7-3-68 from Sri B.P. Sinha, D.M.O., Health, Monghyr	22-6-68
MM D18	Letter No. 973 dated 5-3-1968 from Dr. R.N. Prasad, Civil Surgeon, Monghyr to E.O. Municipality, Monghyr	22-6-68
MM D19	Letter No. 53/JK dated 5-3-1968 from Executive Officer, Municipal Board, Monghyr to Civil Surgeon, Monghyr	22-6-68
MM D20	Letter No. 64/JK dated 9-3-68 from E.O., Monghyr Municipality to D.M. Monghyr	22-6-68
MM D21	Order of the Executive Officer, Municipal Board, Monghyr dated 10-3-1968	22-6-68
MM D22	Office order of the Executive Officer, Municipal Board, Monghyr dated 10-3-1968	22-6-68
MM D23	Chemical Analysis report taken from 5-3-68 to 18-3-68	22-6-68
MM D24	The Bacteriological examination report from 5-3-1968 to 15-4-1968	22-6-68
MM D25	Original order of announcement (regarding water supply in the Monghyr town) dated 2-3-68, 5-3-68, 7-3-68, 9-3-68 and 10-3-68	22-6-68
MM D26	Log-book of Mechanical Filter of Kasturba Water Works, March, 1968	22-6-68
MM D27	Log-book of intake pumping station Kastharnighat, Monghyr, March 1968	22-6-68
MM D28	Dak-book of water works in which work showing dolivery of letter No. 47 of 2-3-68	22-6-68
MM D29	Vouchers for Rs. 23,288·30 filed by Monghyr Municipality	15-10-68
MM D30	Vouchers for Rs. 177·07 filed by Monghyr Municipality	15-10-68
MM D31	Vouchers for Rs. 507·75 filed by MM in respect of cost of lowering foot valve at Kastharnighat Pumping Station	15-10-68
MM D32	Vouchers for Rs. 139·05 filed by MM towards cost of correspondence (telegrams, telephone etc.)	15-10-68
MM D33	Vouchers for Rs. 571·80 filed by Monghyr Municipality in respect of overtime and labour charges paid to Municipal staff	15-10-68
MM D34	Vouchers filed by Monghyr Municipality in respect of expenditure by Chairman and his party	15-10-68
MM D35	Vouchers for miscellaneous expenditure, amounting to Rs. 6,094·40 filed by Monghyr Municipality	15-10-68
MM D36	Original voucher for Rs. 25,000 and other vouchers for Rs. 25,829 filed by Monghyr Municipality	15-10-68
MM D37	Vouchers for Rs. 12,032 filed by Monghyr Municipality for materials supplied and labour charges	22-10-68
MM D38	Vouchers for Rs. 27,574 filed by Monghyr Municipality	25-10-68
MM D39	Estimate for Rs. 3,000 for Desilting of Settling tanks	25-10-68
MM D40	Estimate for Rs. 63,000 for cleaning of distribution main in the whole town	25-10-68
MM D41	Estimate for Rs. 5,56,700 for addition and alteration of Monghyr water supply scheme	25-10-68
MM D42	Estimate for Rs. 2,00,000 for providing source of water from 10" below the water level	25-10-68
MM D43	Estimate for Rs. 1,65,000 for installation of motor pump sets in deep wells of the town	25-10-68
MM D44	Sinking of tube wells in Monghyr town, estimate for Rs. 1,65,000	25-10-68

APPENDIX VIII (ii)

DOCUMENTS/COPIES OF DOCUMENTS RECEIVED FROM BIHAR GOVERNMENT

Exhibit No.		Date of Receipt
BGD 1	Copy of Chemical & Bacteriological Report from 5-3-68 onwards by PHED Research Unit-Public Health Institute, Patna	
BGD 2	F.I.R. and the Policy Diary, received from Supdt. Police, Monghyr	15-10-68
BGD 3	Copy of the Report of Shri I.D. Pandey of R.D. College, Monghyr—dated 3-3-1968 (original report at MMD-2)	
BGD 4	Report of Inquiry by Shri Maheswari Prasad—Inspector of Factories, Monghyr Circle, Monghyr dated 26-3-1968 (original)	20-9 68
BGD 5	Report of Inquiry by Shri M.K. Roy, Inspector of Factories (Chemical) Patna dated 22-3-1968 (original)	20-9-68
BGD 6	Final report of Inquiry by Inspector of Factories (Medical), Bihar Inspector of Factories, Monghyr, and Inspector of Factories (Chemical), Bihar dated 8-7-68 (original) received from Medical Inspector of Factories, Patna	11-9-68
BGD 7	Copy of the report by Chief Engineer Shri S.N. Sahai, PHED, on the estimates of probable cost (of providing alternative source of supply of water due to pollution of Ganges (enclosure to Bihar Government Memorandum—annex. VIII)	15-7-68
BGD 8	Original analysis report PSL No. 451/68 dated 24-6-1968 on samples taken by Police—submitted by Shri Sadanand Trivedi, officer Incharge Police Station, Monghyr	19-9-68
BGD 9	Barauni Refinery's D.O. No. P/W/734 dated 1/2-4-68 with copy of Treatment & Disposal of effluents from Barauni Refinery—Handed over by Shri M.K. Roy, Inspector of Factories (Chemical) Patna	21-9-68
BGD 10	Information supplied by Bihar Government as clarification of entries in Annexure II of their Memorandum, regarding Shri Maheshwari Prasad, Inspector of Factories, taking samples of discharge at 3 points —and original notes of analysis made by Shri M.K. Roy in the Laboratory ..	16-10-68
BGD 11	Letter No. 53 dated 3-1-67 from Chief Inspector of Factories, Bihar, Ranchi, approving the Barauni Refinery's scheme for disposal of wastes and effluents together with the original scheme submitted by the Barauni Refinery	16 10 68
BGD 12	D.O. letter No. 2431 dated 18-9-61 from Shri P.K. Lahiri, to Shri K.R. Bhide, Technical Adviser and	
13, 14	Chief Engineer, Hathia Project regarding sewage disposal scheme of Barauni Refinery (BGD 12) .. D.O. letter No. GM/Htdh/Sewerage/80/61/12792 dated 19-9-61 from Shri S.K. Mallick, G.M., Barauni to Shri K.R. Bhide (BGD 13): and letter No. H/59-102/61-PHE/277 dated 9-2-62 from Shri K.R. Bhide giving approval to the scheme (BGD 14)	18-10-68
BGD 15	Letter No. P/Est-2436 dt. 14-6-66 from Barauni Refinery alongwith scheme for disposal of wastes and effluent and drawings in original	19-10-68
BGD 16	Comments of Shri M.K. Roy, Inspector of Factories (Chemical) in his letter No. 496 dated 16-9-66 ..	19-10-68
BGD 17	Copy of Chief Inspector of Factories letter No. 2D/107/66-6778 dated 25-10-1968 addressed to Barauni Refinery, forwarding comments of Shri M.K. Roy	19-10-68
BGD 18	Copy of letter No. P/W/4183 dated 23/24-11-66 received from Barauni Refinery BGD 15 to 18 which were received from Chief Inspector of Factories, Bihar, Ranchi	19-10-68

APPENDIX VIII (iii)

DOCUMENTS CALLED FROM BARAUNI OIL REFINERY

Exhibit No.		Date of Receipt
BRD 1	Log-book of sector 6 maintained by Operators under Power & Utilities Department, from 1-1-68 to 6-3-68	13-8-68
BRD 2	Log-book of water supply maintained by the Shift Incharge under sector 7 (Power & Utilities Dept) from 19-1-68 to 6-3-68	13-8-68
BRD 3	Log-book of sector 6 kept by OM & S(R) Oil Movement & Storage for entries by Shift Chemical Operators from 2-1-68 to 5-3-68	13-8-68
BRD 4	Oil Dips Register of sector 6 of OM&S (R) entries from 25-10-67 to 27-2-68	13-8-68
BRD 5	Shift Foreman's Log-book of OM&S—This comprises all sections under OM&S including sector 6. Entries from 17-1-68 to 27-2-68	13-8-68

APPENDIX VIII (iii)—*contd.*

Exhibit No.		Date of Receipt
BRD 6	Daily data of water supply maintained by Power Utilities Deptt. from 1-4-67 to 29-2-68 ..	13-8-68
BRD 7	Log-book of sector 6—Electrical Deptt. from 6-3-68 to 20-3-68	13-8-68
BRD 8	Log-book of water supply maintained by Power and Utilities Deptt. from 6-3-68 to 20-3-68 ..	13-8-68
BRD 9	Oil Dips Register of sector 6 kept by OM&S (R) from 27-2-68 to 20-3-68	13-8-68
BRD 10	Shift Foreman's Log-book of OM&S (R) from 27-2-68 to 20-3-68	13-8-68
BRD 11	Shift Foreman's Log-Book of AVU I (Production Department) from 1-1-68 to 29-3-68	13-8-68
BRD 12	Shift Foreman's Log-book of AVU II (Production Department) from 1-1-68 to 24-3-68	13-8-68
BRD 13	Sector VI Log-Book maintained by Operators (Utilities)—Electrical Department for the period 22-9-67 to 31-12-67	13-8-68
BRD 14	Records of water Test Results for recirculating water and effluent water maintained by the Chemical Laboratory for the period 24-11-67 to 31-12-67	2 9-68
BRD 15	Records of water Test Results for recirculating water and effluent water maintained by the Chemical Laboratory for the period 1-1-68 to 3-8-68	2-9-68
BRD 16	Records of water Tests from the effluent system upto the sewage outfall maintained by Chemical Laboratory for the perlod 20-3-68 to 28-3-68	2-9-68
BRD 17	Effluent pumping station Log book maintained by the operators of Public Health (Electrical Department) from 1-3-68 onwards	2-9-68
BRD 18	Effluent pumping station log-book maintained by the operators of Public Health (Electrical Department) from 1-10-1967 to 29-2-1968	15-8-68
BRD 19	Daily maximum and minimum temperature and rainfall data from 1st October, 1967 to 31st March, 1968 obtained from office of the Ganga Circle, Hathidah (Ministry of I & P)	26-8-68
BRD 20	Statement containing the periods for which each pump has operated at the effluent pump station each day from 1st to 15th March 1968	26-8-68
BRD 21	Original Inspection and Investigation Report on the incident conducted by the officers of I.O.C. and forwarded to the Board of Directors	29-8-68
BRD 22	Extracts of drawings showing industrial and storm water sewerage lines from kerosene tanks and tank elevation and details of syphon-cock	26-8-68
BRD 23	Sectional drawing of Oil separators	26-8-68
BRD 24	Oil accounting for refinery production and products from 15th February, 1968 to 1st March, 1968 ..	26-8-68
BRD 25	Estimated flows of refinery effluents and fecal discharge from township and refinery	26-8-68
BRD 26	Test Report of Barauni Refinery on the samples supplied by Shri K. Raghuramiah, Minister of State in the Ministry of Petroleum and Chemicals	8-9-68
Original Annexures A, B, C, D and E to petition to Monghyr Municipality Dt.		
BRD 27'A'	Production Engineer's note embodying suggestions for improvement of sector 6 forwarded by G.M., Sardar Balwant Singh vide his note dated 28-9-67 to C.M.E.	18-9-68
BRD 28'B'	Original report of sector No. 6—OM&S (R) dated 27-9-67 by Shri K.P. Tuli, Production Engineer ..	26-8-68
BRD 29'C'	Original note on processing of slops by Shri K.P. Tuli, Production Engineer dated 8-1-68	26 -868
BRD 30 'D'	I.O.C. Barauni Refinery original inter-office" Memo. No. DEEPU/0310/432 dated 1/2nd March, 1968 regarding "flow of oil from Guard Basin to Effluent Pump House" signed by Shri V.B. Hajela, Deputy Electrical Engineer (P&W)	18-9-68
BRD 31'E'	Original daily operation report—Water Supply Division dated the 25th February, 1968	18-9-68
BRD 32	Register for the year 1967-68 showing production and disposal of ATF during January-March 1968 furnished by Central Excise Office, Barauni Refinery (Same as "OD 5")	19-9-68
BRD 33	RT 3 return in respect of ATF for January-March 1968 (Monthly Return of Excisable Goods manufactured and issued)- -Furnished by Central Excise Office Barauni (Same as OD-6)	19-9-68
BRD 34	Daily operation Report—Water Supply Division, Barauni Refinery—from 2-2-68 to 6-2-68 and 8-2-68 to 5-3-68	19-9-68
BRD 35	O.T. slip No. 52447 dated 24-2-68 of Shri K.P. Singh, Grado IV Token No. 883	20-9-68
BRD 36	O.T. Slip No. 52446 dated 24-2-68 of Shri S.S. Yadav, Grade IV Token No. 882	20-9-68
BRD 37	O.T. slip No. 52148 dated 24-2-68 of Shri R.N. Singh, Grade II, Token No. 785.	20-9-68
BRD 38	Shift Foreman's Log-book OM&S(D) from 24-1-68 to 3-3-68	22-9-68
BRD 39	Copy of letter No. H.S. 9-102/62-PHE/227 dated 9-4-62 from Shri K.R. Bhide, Technical Advisor to Government, P.H.E. Deptt. Bihar with copy of report on Sewage Treatment and Disposal for Barauni Refinery	23-9-68
BRD 40	Memorandum of settlement dated 7-10-67 between I.O.C. (RD) Barauni Refinery and workmen represented by Barauni Tel-Shodhak Mazdoor Union	23-9-68
BRD 41	Copy of leave order dated 14-2-68 issued by Barauni Refinery granting 16 days earned leave from 16-2-68 to 2-3-68 to Shri J.S. Gill, Executive Engineer (Elec.)	23-9-68
BRD 42	Memorandum of Settlement dt. 21-8-68 between I.O.C. (RD)—Barauni Refinery and workmen represented by Barauni Tel-Shodhak Mazdoor Union	23-9-68
BRD 43	Original scheme regarding disposal of wastes and effluents, with forwarding letter dt. 14-6-66 submitted by Barauni Refinery to the Inspector of Factories	22-9-68
BRD 44	Shift Foreman's Log-book—water supply (P&UD) from 23-10-67 to 18-1-68	15-10-68

APPENDIX VIII(iii)—*concld.*

Exhibit No.		Date of Receipt
BRD 45	Instruction Book of Om 5 (Receipt)	15-10-68
BRD 46	Instruction Book of Om 5 (Despatch)	15-10-68
BRD 47	IS :1518-1960—Indian standard method for gauging of Petroleum and liquid petroleum products	17-10-68
BRD 48	Organisation charts of production and power utilities Dept. of refinery, as approved by Board of Directors	17-10-68
BRD 49	Daily Dip statements of slops tanks and vessels at 7·00 hrs for the months Sept. to Dec. 68 and from 1-1-68 to 8-1-68	20-10-68
BRD 50	Dip Data for February 1968 (prepared by Dr. Krishna)	20-10-68
BRD 51	Tour programme of Dy. General Manager (Tech.) Barauni Refinery from 11-9-67 to 1-10-67	20-10-68
BRD 52	Slop Dips in sector VI including TK 11 and TK 12 for the period 2-1-68 to 8-3-68	20-10-68
BRD 53	Dip Register of sector VI from 27-7-67 to 20-10-67	20-10-68
BRD 54	Specimen proforma of Daily Tank Dip Report	25-10-68
BRD 55	Specimen of oil Movement and Storage Division's Daily Pumping Report	25-10-68
BRD 56	Extracts of daily tank dip reports @7·00 hrs. for crude oil, slops, and SK/ATF from 15-2-68 to 29-2-68	15-11-68
BRD 57	Copies of Daily Pumping Reports on SK/ATF from 15-2-68 to 29-2-68	15-11-68
BRD 58	Crude oil and slops processed in AVUs during the period August, 1967—February, 1968	15-11-68
BRD 59	Copy of Tank Dip Register—OMS(D)—from 16-2-68 to 7-3-68 (same as BRD 87)	15-11-68
BRD 60	Extracts of Finished product Operator's Log-Book from 26-1-68 to 13-3-68 (same as BRD 88)	15-11-68
BRD 61	Drawing No. PH/D/12—48" Steel Pumping main for effluent at Barauni Refinery	14-12-68
BRD 62	Inter-office Memos. issued by V.P. Hajela, DEE (P&U) and B.D. Gupta, Executive Engineer (A to X)	14-12-68
BRD 63	Log-book OMS(R) from 5-8-67 to 15-11-67	20-11-68
BRD 64	Shift Foreman's Log-book OMS(R) from 21-8-67 to 24-9-67	20-11-68
BRD 65	Log-book OMS(R) from 17-11-67 to 1-1-68	20-11-68
BRD 66	Shift Foreman's Log-book OMS(R) from 25-10-67 to 19-12-67	20-11-68
BRD 67	Shift Foreman's log-book OMS(R) from 19-12-67 to 16-1-1968	20-11-68
BRD 68	Sector 6 Log-book OMS(R) from 17-4-67 to 4-8-67	20-11-68
BRD 69	Two charts for the years 1966 and 1967 showing dip readings in tanks N1-N4, oil pit, separators, etc.	20-11-68
BRD 70	Shift Foreman's Log-Book OMS(R) from 20-3-67 to 15-5-67	20-12-68
BRD 71	Shift Foreman's Log-Book OMS(R) from 15-5-67 to 20-8-67	20-12-68
BRD 72	Sector 6 Dip Register from 17-1-67 to 12-5-67	20-12-68
BRD 73	Sector 6 Dip Register from 17-5-67 to 20-6-67	20-12-68
BRD 74	Original Inter-office Memo. dated 12-1-68 written by Shri Y.D. Puri, Plant Manager, regarding "High Slop inventory in the refinery"	18-12-68
BRD 75	Sector 6 Dip Register from 21-6-67 to 27-7-67	21-12-68
BRD 76	Shift Foreman's Log-book OMS(R) from 19-12-67 to 11-2-68	21-12-68
BRD 77	Shift Foreman's Log-book OMS(R) from 11-2-67 to 20-3-67	21-12-68
BRD 78	Sector 6 Dip Register from 2-1-66 to 25-6-66	21-12-68
BRD 79	Sector 6 Log-Book of OMS(R) from 14-12-65 to 4-8-66	21-12-68
BRD 80	Shift Foreman's log-book OMS(R) from 27-9-65 to 18-2-68	21-12-68
BRD 81	Sector 6 Log-book OMS (R) from 28-12-66 to 27-2-67	21-12-68
BRD 82	Sector 6 Log-book of OMS (R) from 27-2-67 to 23-3-67	21-12-68
BRD 83	Operator's Log-book (Electrical) from 1-3-66 to 25-5-66	20-12-68
BRD 84	Shift Foreman's Log-book from 14-7-66 to 25-12-66	20-12-68
BRD 85	Shift Foreman's Log-book from 11-4-67 to 28-8-67	20-12-68
BRD 86	Shift Foreman's Log-book (Water Supply) 29-8-67 to 22-10-67	20-12-68
BRD 87	Tank Dip Register OMS (D) from 16-2-68 to 7-3-68	25-10-68
BRD 88	Finished product operator's log-book OMS (R) from 26-1-68 to 13-3-68	25-10-68
BRD 89	Minutes of the weekly meeting held on 30-4-68 in the office of the General Manager	19-12-68
BRD 90	Original Bin-cards maintained for Dip Tapes in the stores of OMS (R)—Copy of the minutes of condemnation committee on 15-10-68 in which one lot of dip tapes was condemned and a copy of note dated 6-12-68 vide which 33 steel dip tapes and 11 dip tapes with bobs were scrapped	20-12-68
BRD 91	Bin card for water-finding paste	23-12-68
BRD 92	Origina' note of Shri Balwant Singh, ex-General Manager, Barauni Refinery dated 13-9-67 concerning sector 6	23-12-68
BRD 93	Original estimate for the work "construction of Road (1st phase) along 48" dia steel pumping main for effluent disposal"	24-12-68
BRD 94	Order sheet of title suit in the matter of ad-interim injunction—case 95 M of 1968	8-4-68
BRD 95	Copy of order u/s 133 Cr. Procedure Code	
BRD 96	Original letter dated 2-4-62 of Shri N. V. Modak to Shri P. R. Nayak, MD. IOC (RD) giving his comments on "Water supply and sewage schemes" of Barauni Refinery	9-4-68

APPENDIX VIII (iv)

DOCUMENTS CALLED FROM VARIOUS OTHER PARTIES

Exhibit No.	Description	Date of receipt
OD 1	Daily temperatures and rainfall data for November/December, 1967 and Jan-Feb. 1968 in respect of Patna Meteorological Observatory, received from Regional Meteorological Centre, Calcutta	29-8-68
OD 2	Information regarding—Flow rates of water in Ganges supplied by Eastern Railway, Danapur ..	9-9-68
OD 3	Report dated 12-9-68 of samples taken by the Commission—(Analysis conducted by I.I.P.) ..	13-9-68
OD 4	Inspection Note of Shri, P.N. Kumra, Chief Engineer (FC) C. W. & P.C. in connection with his visit to Barauni and Monghyr areas from 8th to 11th March, 1968	3-10-68
OD 5	Register for the year 1967-68 showing production and disposal of ATF during Jan-March, 1968 furnished by Central Excise Office, Barauni Refinery	19-9-68
OD 6	R. T. 3 return in respect of ATF for Jan-March, 1968 (Monthly return of Excisable goods) ..	19-9-68
OD 7	Report of Shri M. Kurion on his inspection visit received from Director, I. I. P., Dehra Dun	28-11-68
OD 8	Register for the year 1967-68 showing production and disposal of S.K.O. (RGI Register) furnished by Barauni Refinery	15-9-68

APPENDIX VIII (v)

DOCUMENTS FILED BY COMMISSION'S WITNESSES

CWD-1	Field book for the period 29-12-67 to 7-3-68 filed by Shri B. D. Gupta (CW 2) on 17-10-68
CWD-2	Copy of D.O. No. SS/PS/68/S dated 6-3-68 from Shri E. N. Mangat Rai, Special Secretary, Ministry of Petroleum and Chemicals to Shri K.P. Mathrani, Secretary, Ministry of Irrigation and Power regarding deputation of a suitable expert of Central Water and Power Commission to visit Barauni and Monghyr areas in connection with the incident—filed by Shri P. N. Kumra (CW 7) on 22-11-1968.
CWD-3	Original analysis/test report on oil sample collected by Shri K. Raghuramiah, Minister of State, Ministry of Petroleum & Chemicals, filed by him before the Commission during his evidence on 19-11-1968 (CW 8).
CWD-4	Teleprinter Message dated 5-2-68 regarding appointment of Shri Balwant Singh as General Manager, Haldia Refinery, filed by Shri Balwant Singh on 20-11-68 (CW 6).
CWD-5	T. P. Message No. BR/581 dated 6-2-68 from Shri Balwant Singh to Maj. Gen. Sardanand Singh filed by Shri Balwant Singh on 20-11-68 (CW 6).
CWD-6	T.P. Message BAR/91 dated 6-2-68 from Shri Sardanand Singh, MD to Shri Balwant Singh filed on 20-11-68 (CW 6).
CWD-7	Memo No. GM/1734 dated 12-2-68 issued by Shri Balwant Singh, to all Heads of Departments to route all files through DGM (T)—filed by Shri Balwant Singh on 20-11-68 (CW-6).
CWD-8	T.P. Message No. BR 855 dated 21-2-68 from Shri Balwant Singh to Maj. Gen. Sardanand Singh regarding Shri Balwant Singh leaving Barauni on 1-3-68—filed by Shri Balwant Singh on 20-11-68 (CW 6).
CWD-9	T.P. Message No. BAR/212 dated 21-2-68 from Maj. Gen. Sardanand Singh to Shri Balwant Singh regarding the stay of Russian delegation and Shri Balwant Singh's coming over to Delhi filed by Shri Balwant Singh on 20-11-68 (CW 6).
CWD-10	Office Order No. P/EB-1 dated 24-2-68 issued by Managing Director, IOC (RD) regarding Shri Balwant Singh's continuing to be overall incharge of Barauni Refinery. The routine matters to be coordinated by DGM (T) Shri Harnal, who will refer all important and financial matters to Shri Balwant Singh, General Manager, functioning from New Delhi—filed by Shri Balwant Singh on 21-11-68 (CW 6).
CWD-11 to 14	Office order Nos. GM/42, GM/43, GM/44, GM/45 dated 29-2-68 issued by Shri Balwant Singh, G. M. regarding delegation of powers, disposal of work and the procedure to be followed during his absence from Barauni and when he functions from New Delhi—filed by Shri Balwant Singh on 21-11-68 (CW 6).
CWD-15	Field book filed by Shri R. N. Singh, Surveyor, Barauni Refinery on 15-12-68 (Not examined).
CWD-16	Copies on Inter-office Memo dated 12-1-68 regarding "High Slop inventory in the refinery filed by Shri Y.D. Puri (CW 11) on 17-12-68.
CWD-17	Answers by Shri Balwant Singh, Ex-General Manager, Barauni Refinery to the questions put to him by the Commission on 10-8-68.

APPENDIX IX
LIST OF WITNESSES EXAMINED

Exhibit No.	Monghyr Municipality witnesses	Date of recording evidence	Pages Nos. in E.R.
MMW 1	Shri P. K. Misra, Chairman, Monghyr Municipality, Monghyr	18 & 19 Sept., 68	1 to 59
MMW 2	Shri Mahoswari Prasad, Inspector of Factories, Monghyr	19 to 21 Nov., 68	60 to 92
MMW 3	Shri M. K. Roy, Inspector of Factories (Chemical) Patna	19, 21, 22 Sept., 68	92 to 138
	Commission's witnesses		
CW 1	Shri Ram Sudhist Kumar, Operator, E.P.S. sector VI, Barauni Refinery	23-9-68	139-161
CW 2	Shri B.D. Gupta, Executive Engineer, Barauni Refinery	23-9-68 & 15 to 17 Oct, 68 (in two sittings)	162-274
CW 3	Shri K. P. Tuli, Production Engineer, Barauni Refinery	18-10-68 to 22-10-68	275-417
CW 4	Shri S. G. Hyder, Shift Foreman, Barauni Refinery	23 to 25 Oct, 68	418-523
CW 5	Shri M. Kurien, Scientist, Indian Institute of Petroleum	16 & 17 Nov, 68	524-616
CW 6	Shri Balwant Singh, Ex-General Manager, Barauni Refinery	18 to 21 Nov, 68	740-898
CW 7	Shri P. N. Kumra, Chief Engineer (Flood Control) CWPC, Ministry of Irrigation & Power	18, 20, 22 and 23 Nov, 68	616-715
CW 8	Shri K. Raghuramiah, Minister for Petroleum and Chemicals, Government of India ..	19 & 21 Nov, 68	716-739
CW 9	Shri K.P. Mandal, Shift Foreman, Barauni Refinery	14th Dec, 68	899-917
CW 10	Shri T.S. Rao, Ex-Asst. Engineer (P.H.) Barauni Refinery	14 & 15 Dec, 68	918-963
CW 11	Shri Y. D. Puri, Plant Manager, Barauni Refinery	16 to 20 Dec, 68	964-1122
CW 12	Shri V.B. Hajela, Deputy Electrical Engineer (P & V) Barauni, Refinery	21 to 24 Dec, 68	1123-1233
CW 13	Shri V.N. Misra, Operator, E.P.S. Barauni Refinery	24-12-68	1234-1247
CW 14	Dr. K.L. Rao, Minister for Irrigation and Power, Government of India	11th April, 1969	

APPENDIX X

DATES OF VISIT TO VARIOUS REFINERIES

Burmah Shell Refinery, Bombay	20-1-69
Esso Refinery, Bombay	21-1-69
Gujarat Refinery, Baroda	12-2-69
Cochin Refinery, Cochin	3-3-69
Gauhati Refinery, Gauhati	25-6-69
Commission's inspection visit of Barauni Refinery	9, 10 & 12-8-1968
Commission's inspection visit of Monghyr and Jamalpur	11-8-1968
Commission's first inspection of effluent pipe-line upto the point of discharge (Barauni Refinery)	10-8-1968
Commission's second visit to effluent discharge point and effluent channel (Barauni Refinery)	18-12-1968
Commission's visit to Bata Shoe Company's factory at Mokahma	19-12-1968

APPENDIX XI

MEETINGS/SITTINGS OF THE COMMISSION

Sl. No.	Place	Dates	Purpose
1	New Delhi	9 & 10-5-68	Preliminary meeting to finalize arrangements.
2	New Delhi	10 & 11-7-68	For study and discussion of affidavits and Memorandum received.
3	Barauni	8-8-68 to 13-8-68	Inspection visit of Barauni Refinery and settlement of procedures to be adopted
4	New Delhi	14-8-68	To decide the names of witnesses to be called.
5	Barauni	18-9-68 to 23-9-68	Recording of evidence.
6	Barauni	15-10-68 to 25-10-68	Do.
7	New Delhi	16-11-68 to 23-11-68	Do.
8	Barauni	14-12-68 to 24-12-68	Do.
9	New Delhi	17 & 18-3-69	Oral arguments.
10	New Delhi	8-4-69 to 19-4-69	Do.
11	Mussoorie ..	14-5-69 to 13-6-69	Writing the report.

APPENDIX XII (i)

COPY

BEFORE THE COMMISSION OF INQUIRY (ABOUT POLLUTION OF RIVER GANGES)

Humble petition on behalf of Monghyr Municipality

Most respectfully showeth:—

1. That the Municipality has received some informations which are mentioned in detailed in a note attached herewith.

2. That the information required will be very valuable for the Commission to arrive at the truth.

Prayed, therefore, that the documents mentioned in the note attached may be called for from the Management of the Barauni Oil Refinery and persons named in the note may also be examined.

Prayed further that the following documents may also be called for:

(a) The Log-book of AVU-1 and AVU-2 for the months of February and March 1968.

Prayed further that the followed persons may be examined by the Commission:

(1) All the operators (they are four) who were on duty from 18-2-68 to 6-3-68 in sector 6.

(2) All the operators who were on duty in AVU-1 and AVU-2 from February and to March 10th, 1968.

Sd. P. K. MISRA
Chairman
Monghyr Municipality
13-8-68

Encls: as above.

STATEMENT

There is a chemical theory that "Bacteriah" forms due to storage of water in the tank bottom. The aviation Treating Fuel (ATF) produced in Barauni Refinery failed to "Silver Corrision Test" and thereby was not meeting the Aviation Fuel Specification. Despite of this defect, ATF was supplied to the Defence, where troubles and defects in their machinery were experienced. Accordingly, they lodged a complaint to the IOC Management, New Delhi, as to why ATF product of your company is giving trouble and defects in our machinery? The IOC management appointed two men's committee to enquire into the matter in detail and submit its report latest by 14th March, 1968.

Sarvashri J. N. D'Souza, Deputy Supply and Distribution Manager, Chairman's office, IOC, New Delhi and Sardar Harbans Singh, Transport Adviser, IOC, New Delhi, were the two members of the committee appointed by the management. The reference of enquiry (referred to above) was sent to the General Manager, Barauni Refinery by IOC Management, New Delhi, vide this letter No. 151-10/31 (1396) dated the 28th February, 1968. The above named members of the committee arrived at Barauni and stayed here on 6th, 7th and 8th March, 1968 and enquired into the cause.

* * *

APPENDIX XII (ii)

COPY

ORDERS PASSED BY THE COMMISSION ON 23-9-1968

For your information we may say that the investigation of the two men committee was conducted purely to study the quality control procedures adopted by the refinery and also at all the storage points upto supply to the air-craft.

The members of the commission have gone through the report of the two men committee (Shri Harbans Singh and Shri D'Souza) very carefully and are of the opinion that it is not in the interest of the public to disclose the contents of the report. We may, however, tell you that this report has nothing to do with the present inquiry.

Sd. MANOHAR PERSHAD
Chairman
Commission of Inquiry on Ganges water Pollution
23-9-68

APPENDIX XII (iii)

BEFORE THE COMMISSION OF INQUIRY ON GANGES WATER POLLUTION

Humble Petition on behalf of the Barauni Oil Refinery

Most respectfully showeth:

I(a) That the commission started recording evidence from 18-9-68 and continued at intervals and finally concluded recording of evidence on 24-12-68.

I(b) That the Hon'ble Chairman of the commission was pleased to direct at Barauni on 24-12-1968 that the written arguments be submitted by the parties. The office of the Commission sent several communications by way of reminders that the submission of the written argument should be expedited.

I(c) That the office of the commission by another communication informed the Refinery that the sitting would be resumed on the 17th March 1969 at Delhi for recording of evidence of Dr. K. L. Rao, Minister of State, Irrigation and Power, and for hearing arguments.

I(d) That on the 17th March, 1969, when the parties appeared before the commission, the Chairman told the parties that the despite his orders the written arguments had not been filed. Anyway, pursuant to the directive of the Chairman, on the 17th March, 1969, the Refinery filed their written arguments and so did the state of Bihar and the sitting was adjourned to the next day, i.e. 18th March, 1969, for orders on the petition for time for about a fortnight prayed for by the Monghyr Municipality.

I(e) That on the 18th, the Chairman was pleased to say that the reading and study of the argument of the refinery bearing six volumes and running to 1101 pages would take atleast a fortnight and before the oral submissions commence, the members of the commission would like to read the written arguments of the parties and therefore the chairman was pleased to say that the next date of the sitting will be intimated to the parties later on.

I(f) That the office of the commission addressed communication informing the parties that the next sitting of the commission will commence from the 8th of April, 1969, for recording evidence of Dr. K. L. Rao and for hearing the arguments.

II(a) That the terms of reference, according to the Gazette Notification appointing the Commission, covers seven items and for the purpose of facility and reference and to make this petition self-contained, these seven items of reference are quoted below:—

(i) To determine the correct facts of the contamination with oil of the river Ganga...

(ii) To determine to what extent the Barauni Refinery has been responsible for the happening.

(iii) To recommend the steps that must be taken to prevent the recurrence of such happenings in the future.

(iv) To advice whether there has been any negligence or carelessness on the part of the Refinery Management and staff in the discharge of their prescribed duties.

(v) Arising out of (iv) recommend the further action, if any, that must be taken.

(vi) To report on the loss or damage to the public.

(vii) Generally, to report on any other matter that is relevant in the opinion of the Commission.

II(b) That it will be seen that item (ii) to (vi) of the reference emerge and rotate round item (i) and the answer to all the items of reference by the Refinery in their argument basically, in essence and in substance, is that the scheme for the effluent discharge as under the act propounded, shape and approved by Mr. K. R. Bhide, the then Technical Adviser to Government and Chief Engineer, Hatia Project, P.H.E. Dept. Bihar, and now a Member of the Commission, undid the elaborate diffusion works of mixing, dilution, and diffusion of the effluent from the bottom of the Ganges by contrivances and diffusion works and he did it even after he was aware of the data and calculation supplied by the Russians and the warnings given by them and the insistence made by them which figure as a component part of the entire project given by the Russians.

II(c) That the responsibility of approval was on him and in the various lurking explicit and implicit flaws contained in the terms of the scheme as sanctioned by him has led to this happening and calamity. All the pages of the argument centre round this defectiveness of the implications and provisions of the approval order by Shri Bhide. The stand taken by the refinery stands revealed from a reference to the various volumes of the written arguments and the further submissions made by Shri B. P. Singh on 13-4-1969, when he opened his argument, that the whole issue centres round Shri Bhide as he was exercising the statutory power to approve the scheme, modify the scheme or

alter the scheme. In the oral argument reliance was placed on BGD-12, where the Executive Engineer under him has drawn his attention in para 2 to 6 of his letter dated 10-9-61 setting out the result of his examination and reporting that the permanent approval of the scheme will be basically thought with danger and mishaps and will fail to accomplish the hitherto known standards to which the scheme for the effluent discharge must conform.

II(d) That the argument proceeds to say that the whole approval was arbitrary and all the consequences that followed on the date of the happening rest squarely on Mr. Bhide, representing the State of Bihar who was exercising the powers under Rule 16 of the Bihar Factory Rules, 1950.

II(e) That Shri B. P. Singh, Bar-at-Law of Patna High Court, a senior barrister putting in 40 years of practice has been engaged by the refinery to work for them and he did so and he has been doing so from the stage of the first sitting of the Commission to record evidence till today.

II(f) That Sri B. P. Singh has been building in his cross-examination the utter worthlessness and ineffectiveness of the final approval order of the scheme fearlessly and boldly and asserting that such was the nature of the approval order and this approval condemned to pieces the document sealed and issued under rule 16 of the Bihar Factories Rules, is the cause of this happening being inquired into and this matter was put to Shri Raghuramiah, the then Minister of State, in the Ministry of Petroleum and Chemicals (CW-8) relating to the scheme and approval order of the Government of Bihar, with which Shri Bhide is linked up inseparably, thus:—

Page 733... Sir, the Russian Experts in that scheme had suggested that according to the scheme there should be diffusion works built and constructed at somewhere one third of the Ganges length and the diffusion from the bottom. That is one. The second was when the local experts worked out, they said too costly and too impossible. Then Sir, the third. The third was that there they worked out that the Ganges also is almost a river of sorrow like Kosi and there is no place where such a construction can be built, the river will be shifting and changing. The other was that in this scheme as it appears it was indicated that it will be enough that 250′ or 250 yd. construction was made in the river. At this stage with all these proposals, that the scheme shows, Dr. K. L. Rao, not as your colleague then, was consultant. Then at that stage Dr. K. L. Rao was consulted. He said the river was such that the construction in the river can be no avail. The only thing possible is to have a direct flow from the pipe-line. After that, a pipeline arrangement was made and that continued from 1964 to the date of the incident.

II(g) It may be mentioned here that when Dr. K. L. Rao came Mr. Bhide examined him and, luckily for all concerned, had the matter clarified that in no way Dr. K. L. Rao approved the final form of the scheme which Mr. Bhide had sanctioned and approved and Dr. K. L. Rao's only advice was confined to keep the outfall point of the pumping main 600′ away from the bank.

II(h) The whole scheme as approved by Shri Bhide was put by Shri B. P. Singh, to Mr. P. N. Kumra, CW-6, an expert of eminence and it was brought out by him that the scheme approved was devoid of the contrivance of dilution by which 50 ppm could be brought down to 0.006 to 0.005 as per the Russian formula, or the mixing up with the minimum discharge of 1/3rd of the Ganges water. How step by step Shri B. P. Singh worked out and got the scheme condemned through the mouth of this witness is quoted below:—

P-687: Mr. B. P. Singh... You find from this scheme that the Russian Engineers had proposed that there should be a diffusion wall in the 1/3rd of the river, located in one third of the river and the diffusion should be from the bottom so that there may be good and complete mixing?

That is written there. It is their suggestion. Chapter VII P. 32 second paragraph. I say that the Indian Engineers of the Refinery considered the diffusion construction at one third of the width of the river to be very difficult to achieve* and the disposal of the diffusion from the bottom again very difficult and instead they proposed there should be a diffusion work 250 ft. inside the river?

Yes.

Now page 34. River outfall. At this stage Dr. K. L. Rao was consulted about the construction of the diffusion work for the effluent and he was of the opinion that the river Ganges is not dependable and creates deep scours and unpredictable erosion and works in the beds should be avoided as far as possible.

Yes.

And in this connection, Dr. K. L. Rao has suggested avoiding the construction work in the bed of the river. The dis-

*P. 688.

charge should go through the pipe towards the bed of the river and after having gone to the required length should stop short of 600 ft. on this side of the river so that between this distance the water may go?

Yes.

And between the pipe and the river the effluent had to go through an earthen channel?

Yes.

Mr. B. P. Singh: Now come to your sketch map. You find here the suggestion of Dr. K. L. Rao of having a pipe in the discharge of effluent from the effluent pumping station towards the river channel erected and put up with this difference that there is 600 ft. of pipeline which was to stop short from the river is also extended and connected with the pipe.

Dr. Krishna: I can't interpret what sketch he saw and what channel?

Mr. B. P. Singh: Kindly listen to me. All that I am asking you is this. Now look to your own.

My suggestion I still hold.

*Mr. B. P. Singh: Let me proceed. I am not asking you to criticise or approve the suggestion of the Minister. At that moment that is not neither here nor there. Your present proposal may be examined vis-a-vis that of Dr. K. L. Rao tomorrow. My question is that the suggestion of Dr. K. L. Rao as the Engineer concerned you find when you went to inspect the effluent channel you have given the date, you found from the effluent pump there was according to his suggestion a metal pipe and you have said with 48 diametre width it is there coming towards the river side with a flap wall.

Dr. Krishna: You agree?

Mr. Kumra: There is a pipeline.

†Sri B. P. Singh: I want to ask you that as a hydraulic expert, do you agree with me that whether it is the Russian formula, as I said of the diffusion or construction of work in the one-third of whether it is the Sanyal formula of construction of 250 ft. in the river, or whether it is Dr. K. L. Rao's as he then was, formula, of a discharge through a pipeline and then through six hundred feet of earthen channel, do you realise that all these three formula or schemes were tried in their own way honestly and earnestly to accomplish a very vital part of the refinery scheme of the diffusion of the waste water? Is it like this?

I have gone through this thing. As far Dr. Rao's point is concerned, I only find that he gave his advice that his portion is subjection to river erosion. Beyond that I do not find this scheme. It is not mentioned here. So, I can not say anything. I do not differ from that thing at all because this is subject to the river's course. Then about the Russians, of course, they have said that it should be from the bottom, it should be diffused from the bottom.

Nearly six hundred feet short of the river bank.

Chairman: That was also Dr. Rao's suggestion.

‡I find that he has said this is subject to the erosion of the river. His proposal I do not know.

Sri B. P. Singh: Please see Chapter VI There you will find that whatever was being proposed, 150 ft. construction taking the diffusion work up to one-third. As far as this proposal is concerned, the refinery proposal, it proceeded on this assumption of taking the diffusion work upto one-third. This Sanyal proposal of having constructions to 150 ft. length in the river bed presupposes, as it written there, I had proposed only about 250 ft. length although having proposed this construction works he has although theoretically the required dilution will not be available immediately after the waste is discharged in the river, the swift current available at the site even in dry weather will soon disperse the waste into large volume as the river flows to give the dilution required. This was not available when you visited?

In the effluent channel there was no flowing water as it has no connection with the river. It implies no dilution with the river could have taken place in the existing circumstances. And the basis of that scheme, the sub-stratum of the basis of the scheme of Mr. Sanyal there is to disappear, is to be negatived, when you went there.

There was no river water flowing. The question of dilution with fresh water did not arise.

Do you know that there is a difference between a vertical dispersion and horizontal dispersion in a river?

*P. 689. †P. 695. ‡P. 696.

If the horizontal dispersion is by diffusion there is the difference. The vertical diffusion where it drops, it may take place soon enough but the horizontal diffusion may take miles.

I would not categorically put it that way. It depends upon the height. Supposing it is very high and there is some shower it can spread over the area. Horizontal diffusion also will depend on the force with which it diffuses and the velocity with which it diffuses. Even if the effluent channel discharges itself in the condition that you found in March, 1968? The Horizontal diffusion, within the Ganges and within the limits of the channel will be very indifferent and will be very scarce and very disproportionate?

If there is no water the question does not arise. See table 10. This diffusion work of 250 ft. within the river was again dependent on the river discharging 1.30 lakhs cusecs?

It is one third quantity. It means if it is mixed in forty thousand.

One third of 1.70 lakhs: Please reconcile it?

It was that was in the design. There is a sentence above the table. 1.7 cusecs is mentioned here.

Dr. Krishna: Kindly see through the asterisk note, that it refers to the discharge in 1958. It is the one third. The rator is fixed, whatever be the discharge; as an example obviously 1958 figure is quoted. Do you agree?

Yes. that is why I say that in the design they must have taken into consideration what was the minimum discharge. The minimum discharge should be there. It should mix up with one third of that water.

Shri Bhide: Mr. Sanyal had gone over the flows through several years and he found that in 1958 the minimum flow discharged was 1.70 lakhs and one-third of that comes to about 56,000 cusecs. So far that mixture he said this will hold 56,000 cusecs.

Sri Kumra: If it is 1.7, if it is the design, one third of that comes to 56,000.

*Sri B. P. Singh: There was in that effluent channel not a drop of this discharge available.

Sri Kumra: May be 10,20 cusecs.

Sri B. P. Singh: This discharge from the Ganges Seepage water is there. May be a small quantity. This much discharge was not there. It was very small discharge from the sub-soil water.

Sri B. P. Singh: Come to page 34. Here what are the vital changes suggested in chapter 8 by Dr. K. L. Rao with regard to what was said in Chapter 6 by Mr. Sanyal. Now will you agree that he completely discountenanced the construction of any diffusion work in the river-bed. Point No. 1 categorically I am asking.

Except these two lines there is nothing I can make out what his ideas are. "He was of the opinion" this also someone is saying.

Sri B. P. Singh: As the words exist, please see that it is said here in the sixth line, please see the opinion is Dr. K. L. Rao was of the opinion that the river Ganges was not dependable and she produces an unpredictable erosion and works in the beds should be avoided as far as possible.

Sri Kumra: That is what is mentioned he has said.

Sri B. P. Singh: What do you understood from this plain language rightly put or wrongly put as it is by Mr. Sanyal that the work of diffusion in the Ganges 250 ft. or anything should be avoided because of the erratic or chaotic.

I will not infer anything from this. I will not infer anything speculative. The river is not dependable, and is capable of erosion in heat and scour in the bed.

Sri B. P. Singh: Therefore the diffusion work should be avoided in the river.

Works in the bed should be avoided as far as possible.

Sri B. P. Singh: Now proceed further. Then you find there in the light of that, †the test of the opinion that you have read, it is further said "It was decided in a meeting held in MD's room in New Delhi that a simple straight forward river out-fall only be adopted in supersession of the elaborate diffusion work in the river bed. It is there.

Yes.

Sri B. P. Singh: Please take out appendix 6 and then read last paragraph. Now with this kindly read—come to page 34. It proceeds to say "Accordingly the proposal shown in appendix 6 is drawn up according to Dr. K. L. Rao the bank is vulnerable upto a distance intercepted by a straight line drawn at 50 degrees with the abetment of the bridge which works out to about 600 ft. Therefore, the outfall sewer is pushed back 600 ft. in length in the head wall and

*P. 698.

†P. 699.

the effluent will flow from this point to the river through a channel. "Now kindly read this appendix 6. Rightly or wrongly whatever is put by Dr. K. L. Rao thinking that in mind and compare this with appendix 6.

Unless I see that trend of the guide bank where 15° the depression takes place upto that, I cannot say because 600 ft. is I find from here. That 600 ft. is derived from 15° and 15° may be the guide ones.

Sri B. P. Singh: My question is how do you interpret appendix 6 as it is? Or is it a block out. Say block out I will surrender. How will you interpret Appendix 6 as it is.

Sri Kumra: This much I am not able to interpret.

Sri B. P. Singh: Very well Sir. Don't interpret Appendix 6, Mr. Kumra. But do concentrate upon the lines that have been read and you do see that whatever is being put in the mouth of Dr. K. L. Rao in this scheme speaks of treble things: One is that the bank vulnerable upto a certain distance and the other is that the pipeline should end 600 ft. from the bank. What do you say?

*One thing I can interpret is that the river bank is vulnerable.

Sri B. P. Singh: What do you understand? Which bank?

The northern bank. Because if the scour can take place erosion in the bank and the scour in the bed can take place.

That is all.

II(i) Shri B. P. Singh, put this question to Mr. Kurien (CW-5) and the questions and answers are quoted thus:—

†Sri B. P. Singh: About the Bihar Government restriction about the permissible limit to the effluent discharge and then its mixing up in the stream, I am drawing here your attention to BRD-39 at page 64. Report of Mr. Sanyal, You find from that the 50 ppm was put the effluent concentration before it met the stream.

It does not say about the effluent concentration. It says about oily matter in the effluent.

Sri B. P. Singh: You put it in your own way.

The oil content as I understand it that way in the concentration after treatment is listed as 50 parts per million.

Sri B. P. Singh: And the oily concentration after mixing and discharge in the river?

It is given as 006.00. That comes to 6 ppm.

Dr. Krishna: It is 0.006 milligrams per litre i.e. 0.006 ppm.

Yes.

Sri B. P. Singh: You will look to the last column. There you noted concentration allowable by the USSR was to be 0.05. You further find below these figures note. Please read that note. Minimum discharge is 1.70 lakhs in 1948. I also want your attention to another para just above table No. 10 on the same page.

Kindly read that.

After treatment concentration only 1/3rd quantity. Minimum only in the Ganges and concentration allowable by USSR.

Sri B. P. Singh: These figures that you have given are tabulated as below are what you have read just now?

There is no direct connection between these. I do not see it.

Sri B. P. Singh: I say that the oil concentration or the effluent according to this scheme is to be to mix up with 1/3 of the minimum flow of the Ganges water?

Not exactly that way. What I understand is if the effluent is mixed with as little as 1/3 the quantity of the minimum flow, something will happen. That is why I understand these premises may occur. Something is missing in this.

‡Sri B. P. Singh: Perfectly so. And that minimum 1/3 quantity is indicated by 1.70 lacs cusecs.

I think the discharge is 1.70 lacs cusecs. That is the minimum discharge and 1/3rd could be 1/3 of this number.

Dr. Krishna: This minimum discharge of 1.70 lacs cusecs obviously refers to the river flow. Now if 1/3 of the minimum of 1.7 is mixed with the flow of the effluent then you got this?

Which one.

Dr. Krishna: This diluted concentration of discharge in river?

Somebody has calculated that after mixing the effluent with 1/3 of 1.70 lacs cusecs, the concentration will drop to 0.006 ppm in the Ganges water mixing but I cannot check this number. Nowhere in this is given the quantity of effluent. I cannot make any calculation on it.

Sri B. P. Singh: The figures are no more needed. Now as an expertise, I want to

*P. 700. †P. 596. ‡P. 597.

get it from you that if this dilution of 1/3 of 1.70 lacs cusecs is diminished, if the effluent does not meet the stream with that column at all initially, then the concentration will not be lower as indicated. The lowering of the concentration after mixing of the water in this stream and the quantity indicated depends upon the effluent meeting with the proportion of water i.e. if the effluent deprived of that mixture is highly concentrated slop lowered?

One can simply say that, if the effluent does not mix with water properly and if it so happens either it does not mix properly or the Ganges water is reduced then the final concentration for mixing may not be as low as the figure quoted here.

Sri B. P. Singh: Yes. There to diminish the polluting effect of the effluent, it was a condition precedent or most vital thing that it should mix with the required quantity of water in the stream. Otherwise the pungent effect will be there?

Either the water to which the effluent is mixed should be there as specified here or the effluent should be diminished. It should have less oil.

Sri B. P. Singh: If neither happens, the pollutant effect will be there.

Both happen at the same time.

Sri B. P. Singh: The other alternative is that assuming that the oil concentration and the effluent remains 50 ppm and the *oil content remains 50 ppm but the dilution in water or mixing in water is reduced to a very very high degree, the pollutant will remain:

I can also assume that the volume and concentration of effluent is also constant i.e. 50 ppm and the volume remaining the same effluent water and not the Ganga water and if that is so, the volume of Ganga water with which the effluent is mixed is less than the concentration of oil after mixing will be higher than the figure quoted after dilution.

II(j) Yesterday, during argument Sri B. P. Singh referred to the sanction order and showed that without the slightest circumspection and weighing and Mr. Bhide referred to pages 31 to 35 as having been the component part of his observed table 10 which contains the portion put to Mr. Kurien and embodied in his approval order and even in cross-examination being put to the witness to defect the scheme never applied and stood abandoned and abnegated under the approval order.

II(k) The greatest condemnation to the scheme has been brought out under the term of reference No. (iii) viz: "to recommend steps that must be taken to prevent the recurrence of such happenings in the future". Under this term as the evidence has emerged it is not at the point 10B of Appendix II in the letter of approval of Mr. Bhide but it is the Russian method of diffusion bringing down the pollutants in the 1/3rd width of the river as given in table 10 of BRD-39, is being given out as the preventive measure, and in this connected the evidence of Mr. Kumra (CW-6) may be referred to:—

**Chairman: Have you made any suggestions in your report as to how dilution takes place and when?

I had given. One was the immediate solution and the other was permanent.

Chairman: In future, how dillution should take place?

I had suggested the pipe-line should be extended upto the main river because now the river is going to stay on there at that place. Then we will have to have some piers on which the pipe-line would be taken to the river bed. Then there should be some arrangements so that it sprays and mixes with the water.

†Mr. Bhide: Can we take the pipe-line over the Gupta bund?

That will be above the floods and then take it over the bridge.

The bridge would be ideal. But there is the Mela. Mela we can avoid?

The people will raise objections. But this will be ideal one. But the people will raise an uproar and people will not accept this.‡ For them the refinery is not so important. This is a religious thing.

Dr. Krishna: Do you support that contention?

If we take it to the bridge I will certainly support it without hesitation. As a technical person and engineer don't you think to make all possible good suggestions and let the matters take their own course. The Government has to see the Mela business.

Chairman: Our suggestions ought to be there.

Dr. Krishna: Mela may not be as important.

Chairman: The proposal is an ideal one?

Yes.

*P. 598.

**P. 630 †P. 714 ‡P. 715.

II(1) Dr. K. L. Rao has also in his cross-examination by Sri B. P. Singh, has supported the diffusion works for the mixing of the effluent vertically in the stream by taking the pipeline on piers upto the middle of Rajendra Bridge or if permitted taking the effluent pipeline on the Rajendra bridge itself and in case of the former it will cost about a crore and a half and more. He said that the cost is of no consequence in such cases. The dispersion of effluent will not be satisfactory by surface spraying but it should be done from the bottom of the river by taking the pipe below the surface of the water.

III(a) That as stated in the preceding paragraphs set-out under section I and II, the chief stand of the refinery from the very beginning has been that the debacle has been the sole and direct result of the statutory sanction contained in the approval letter of Mr. Bhide, representing the Government of Bihar and it will be sad to turn to the refinery for the mishap instead of turning to Mr. Bhide.

III(b) That though the Government of Bihar is a party, but in view of the commitments of Mr. Bhide and he being the author of the approval of the scheme, the extreme vulnerability of which is on the anvil and which is being sought by the refinery to be proved as the chief factor responsible, for the happenings, is a party and has been a party and to his knowledge this case of the refinery as indicated has been put and built.

III(c) That the appropriate Government under section 3 of the Commission of Enquiries Act, in this case, is the Central Govt. in the Ministry of Petroleum and Chemicals had appointed Mr. Bhide as one of the experts and verily not knowing that Mr. Bhide was as much a party as the Government of Bihar and had to defend himself in controversies raised in the vital matter of the scheme that he had sanctioned.

III(d) Shri B. P. Singh, Counsel for the Refinery, was expecting all the time that the Commission of Enquiries Act being quasi-judicial proceedings, Sri Bhide would not like to figure as a Judge in his own case nor would like to figure as inquirer about the infirmities of the

IV(a) That yesterday before the proceedings commenced Mr. B. P. Singh brought it to the notice of the commission that Mr. Bhide's position, in the light of the controversies raised as mentioned above, was more or less that of a Judge in his own cause and the dictates of natural justice and fair play required that he should restrain himself from pronouncing upon the inherent futility of his own sanction order which is a vital issue for the commission to report upon. Therefore, it is high time he informed the appropriate Government about his position or the Chairman of the commission appraise the Government of the situation that has cropped up about one of the members of the commission viz. Shri Bhide.

IV(b) Shri B. P. Singh, further stated that the position was embarrassing for him to criticise the author of the sanction order of the scheme in his own presence and all the written arguments filed by the refinery in response to the orders of the commission and the argument that are being advanced from day to day relate to the same central question.

IV(c) That when the refinery counsel, Shri B. P. Singh made this statement before the commission, Shri P. K. Mishra, who contends for the invulnerability and perfectness of the terms of the sanction order of the scheme by Shri Bhide raised an objection and said that such a statement was an "abuse on the member of the commission". The lawyer appear for the Government of Bihar, Shri R. B. Singh, whose stand is identically the same as that of the Monghyr Municipality put in his protest and that on these protests Shri B. P. Singh said that he has raised a vital point which goes to the very root as to the constitution of this commission and the continuance of one of the members of the commission, Shri Bhide, on the controversies raised was against the principles of natural justice embodied in the maxim "no one can be the judge of his own cause" and the instincts of self defence and self-preservation of his name and position then as Chief Engineer was a relevant factor. Shri B. P. Singh said that he will put in a petition showing how Mr. Bhide was a judge in his own cause and the name will be put on record. Here it may be stated that the outburst of Shri P. K. Mishra that the Counsel for the refinery, Shri

mission including the Chairman are individually under the terms of appointment have coordinate equal powers. It is, therefore prayed as follows :

1. This petition may be kept on record.
2. A copy of this petition (submitted herewith) may be sent to the Central Government as the point raised in this petition falls beyond the jurisdiction and competence of the Chairman and other members of the Commission and it can be only dealt with by the appointing authority, i.e. the Central Government.

Filed on behalf of the Barauni Refinery.

Dated: 14*th April*, 1969.

Sd. ANANTA KUMAR SINHA
Advocate

APPENDIX XII (iv)

REJOINDER PETITION, DATED 15.4.1969 FROM MONGHYR MUNICIPALITY ON THE ABOVE SUBJECT

BEFORE THE COMMISSION OF INQUIRY GANGES WATER POLLUTION

The Humble Petition on behalf of the Monghyr Municipality

Most respectfully showeth:

1. That a petition (running in 24 pages) was filed by BOR on 14-4-69 praying that the petition may be kept on record and a copy of it should be sent to the Central Govt. as the points raised falls beyond the jurisdiction and competence of the Commission.

2. That it seems rather strange that a petition is filed before this Commission when the petitioner himself says that the points raised in the petition fall beyond the jurisdiction and competence of the commission.

3. That the real intention of the BOR appears to be to scuttle the work of the commission itself by raising some points at the argument stage.

4. That the commission was appointed by Notification dated the 20-4-1968. The BOR filed its first affidavit on 16-6-68 and its counter-affidavit was filed on 26-8-68 and Sardar Balwant Singh, the General Manager, BOR, made a statement before the commission on 10-8-68 at the time of the local inspection by the commission.

5. That Sardar Balwant Singh, General Manager, Mr. Tuli, Production Engineer, Mr. Puri, Mr. Tuli's Assistant, Mr. Hajela, Dy. Chief Electrical Engineer have appeared before the Commission as witnesses and Sri G. S. Harnal, Dy. General Manager, and Sri Ayyar, Chief Electrical Engineer, have sworn affidavits.

6. That the evidence stage was closed, the argument of Monghyr Municipality and Bihar Govt. was over on 13-4-69 and on 14-4-69, at such a late stage, the points mentioned in the petition dated 14-4-69 have been raised.

7. That the substance of the petition is that the scheme of effluent disposal, vide BRD-39, submitted by BOR to the Govt. of Bihar, was itself defective as it did not provide for elaborate diffusion works of the effluent as suggested by the Russians and that Mr. Bhide, the then Technical Adviser to the Govt. of Bihar, by approving the scheme, as submitted by BOR did something wrong and arbitrary and, therefore, all the consequences that followed on the date of the happening i.e. contamination of the river Ganges and events at Monghyr town were due to the fault of Mr. Bhide. Because Mr. Bhide approved such a scheme, the calamity occurred. So it is not the BOR which is to be blamed. The cause of debacle was the inherent infirmities of the terms of approval of the scheme, whereas the Municipality and the Govt. of Bihar were contending that the cause of the debacle was the breach of the terms of the sanction order. Under the circumstances, it is desirable that Mr. Bhide should cease to be a member of the Commission, because he cannot be a judge in his own cause.

8. That the whole petition is very belated and it appears that it has been conceived to undo the work of the commission so far and to delay the fixing of the responsibility and to avoid its consequences as far as possible, thinking the report of the Commission may go adverse the BOR.

9. That neither in the first affidavit and counter-affidavit nor at the time when the officials of the BOR were examined as witnesses, such a case on behalf of BOR was put forward as has been put forward now at argument stage and specially in the petition filed on 14-4-68.

10. That the whole petition is misconceived because it will appear from BRD-39 that it was

the BOR itself which gave up the diffusion work in the bed of river Ganges. At page 29 (Chapter VI) the BOR says: —

> "No location was found where we could take our diffusion works upto 1/3rd width of the river and the river is very shallow on the left bank and the problem has been accentuated by sand banks coming up here and there in the river bed. The site close to the Ganga Bridge though provides an unbroken width of the river, could not be selected as an annual fair involving large scale bathing and extending over a month is held on the sands of the left bank here.
>
> The location that has been selected has been influenced by a stable channel close to a high alluvial bank of no recent formation. An inspection reveals that the current is deflected from the right bank near the bridge and strikes against this high bank. This is likely to ensure continuous stability of the channel at this location, though we do not get 1/3rd width of the river and the high bank will be the General Manager in the company of the Chief Engineer and the undersigned".

Whole of Chapter VI has been included in Appendix 2 and Mr. Bhide has signed on it in proof of the fact that Chapter VI is part of Appendix 2 which has been approved by the Govt. of Bihar. The location "Point-10B" was visited by Sri Bhide alongwith the General Manager and Mr. Sanyal, the Chief Public Health Engineer and it was seen that there was a stable channel close to the high bank. At page 32, it is said that "After the waste is discharged into the river (i.e. at point 10B) the swift current available at the site, even in dry weather will soon disperse the waste into larger volumes as the river flows to give the dilution required ..... I may mention here that the required dilution has been based only on 1/3rd of minimum flow of the Ganges". After page 32, comes page 33 and at this stage, vide Table-10 the BOR, undertook that the concentration of oil after treatment will be 50 ppm and 0.006 after discharge in river. In other words, the BOR undertook to produce 0.006 concentration in the river, on the basis of the effluent waste falling into the steady current near point 10-B without diffusion works. The essence of the approval was falling of the effluent into live current of the river Ganges and not in an effluent channel or an old creek.

11. That after the incident of 2nd March, 1968, at Monghyr it was found that the effluent was not being discharged into the Ganges, but in an old creek of the river Ganges without having any link-up with the main river. In para 90 of their affidavit, the BOR says that the effluent was being discharged through an effluent channel from 1964 and this their case, as put forward to Mr. Raghuramiah. From the evidence of Mr. T. S. Rao, it appears that in the post monsoon period of 1966, the effluent channel had no connection with the Ganges. So, it is apparent that the BOR had been discharging the effluent from the Refinery against the approved scheme, vide BRD-39 from 1964 and it is strange that they are talking of the inherent deficiencies of BRD-39 when that scheme was never acted upon by them. It has to be considered that when the BOR never acted according to BRD-39 how they can submit at this late stage that the whole calamity has been due to the inherent deficiencies of BRD-39.

12. That according to BRD-39, the BOR had undertook to discharge the wastes in the live current of the Ganges and if the river has receded even before the starting of the refinery, it was the duty of the BOR to shift "Point-10B" to wherever the main channel of the river Ganges was. Point 10B includes two things, one is, effluent discharge falling from the 46" dia. steel pipe and the second is that the effluent from the steel pipe is falling into river Ganges itself. Both go together and the BOR cannot say that Point 10-B was a static point which could not be touched or changed by BOR even if river Ganges was not at Point 10-B.

13. That it will appear from the evidence of Mr. T. S. Rao, CW-10 at page 951 to 954 as given below :

> Mr. B. P. Singh : "Yesterday, you were put some questions about the order of the Bihar Govt. I want to put you certain questions on that topic, and bring before the Hon'ble members of the Commission certain important features, that order was redundant, order was not necessary and it was an uncalled for order and not permitted under the rules of the Bihar Rules framed under the Indian Factories Act. Point one is that so far as the discharge sewerage system, as has been propounded in Mr. Sanyal's report is, was to be a sewage system EPS, the pipeline and all that, to be constructed by the factory to be owned by the factory and it was not a public sewerage system. The sewerage system for the disposal of industrial waste pumping to the EPS when having pipeline for 5 to 6 KM, then the outfall, then the destination of it was to be through a sewerage system set-up in the factory under the report of Mr. Sanyal?
>
> Yes.
>
> Mr. B. P. Singh : You know that the Municipality must have a sewage system and

some waste may have to be industrial waste and some industries coming up in Monghyr may have the necessity of discharging their waste in that the public sewage system. Those contingencies may be there. Therefore, do you agree that public sewage system is maintained by State or quasi-organisation and this sewage system of yours was of different kind and was to be owned by the factory?

I do not agree. As far as we are concerned with the limitation of the township and dimension of the Refinery boundary it is a private system. But we are discharging into a river course which is being used by other public also. So upto this point it is our private sewage system. Sewage maintained by the State or maintained by the Municipality are also public sewage system?

Yes.

You may also conceive of cases where in a town a small industry which may come up has to discharge its industrial waste and it may be permitted to discharge it in the public sewage system? When it is permitted by the authority. 15-12-68.

As I understand the law, Rule 16 says that only when an industry wants to discharge its waste in a public sewage then alone permission of the Health Department or Public Health Engineer Department or the Director of Public Health Service is necessary otherwise not. If that be the necessary because you are not discharging in a public sewage?

Yes: If a public authority have built the sewage system then permission will be needed by the authority who have built it.

The law is that only when the discharge is made in the public sewage system then only permission from Govt. is necessary otherwise it is not necessary then you will agree that it was a private sewage system so permission was not necessary?

Yest, if the law is like that.

If I tell you that the whole permission accordingly was given under a misconception by the Govt. of Bihar and was sought under a misconception by a factory no question of any breach arises, do you agree or not?

The question of misconception I cannot agree.

Do you know in this case that applications have been made under the Factory Act to the Chief Inspector of Factories and the same was kept pending for years and years and even till the date of the incident, the approval had not come?

I do not know that.

If I tell you that in the matter of a discharge of a privately owned or company owned even in public sector by a disposal sewage it is the Factories Act alone that can sanction the scheme, either the same or refuse the scheme, then you will agree with me that things were discharged but in such a state of suspense, arrangements like the provision of a path or other facilities for crossing costing lacs and lacs would not be safe because every thing was in a fluid stage?

That is upto the management".

That the trend of the BOR at the evidence stage was that no sanction was taken, vide BRD-39 was required. It was not their case that only one sanction is required and not two. Their case was that no sanction was absolutely required from any quarter, i.e. neither from Director of Public Health nor from the Chief Inspector of Factories.

14. That when Mr. Kumra was examined and cross-examined, there also it was not the case of BOR that the devil was BRD-39.

15. That it is apparent that the facts mentioned in the petition dated 14-4-69 are deliberately created and thought out, ill-conceived, facts with an ulterior motive to scuttle the work of the commission and to make un-warranted reflections on the members of the Commission to provoke them to say or order some thing which will bring the work of the commission to a stand still.

16. That assuming that there is some sense in the points raised about BRD-39, even then to say or to suggest that Sri Bhide should not sit in the commission, is uncalled for and unwarranted because that will be putting the cart before the horse. The commission will hear when the BOR has to say and come to some decision after hearing the parties. The BOR has no justification to anticipate the findings of the commission and to make a grievance on the basis of anticipated decision.

17. That the matter of contamination is a matter of fact and not a matter of law. The stand taken by a party is a question of fact and not question of law. There was no question of interpretation of law by Sri Raghuramiah or Sri T. S. Rao.

18. That if the BOR had any grievance, their proper course should have been to move the Supreme Court and get a stay-order immediately after 13th April Notification and they cannot be permitted to raise such pleas at the fag end of the work of the commission.

19. That allegations made in para 2-J at page 18 of the petition dated 14-4-69 filed by BOR that yesterday (i.e. on 13-4-69) during argument Mr. Bhide suddenly observed that Table 10 which contains the portion put to Mr. Kurien and embodied in his approval order and even in cross-examination being put to the witnesses to defect the scheme never applied and stood abandoned and abregated under the approval order is absolutely wrong and unfounded. Mr. Bhide never made any such observation and on 14-4-69 when Mr. B. P. Singh the Learned Advocate, of the BOR made reference to such an observation by Mr. Bhide, he flatly denied to have made any such observation and the learned Advocate of BOR agreed to it that he takes that no such observation was made.

20. That there is no question of forwarding a copy of the petition dated 14-4-69 to the Central Government and the Municipality objects to such a prayer and submits that it should be rejected, because this move is a malicious move, a mischievious move to scuttle the work of the commission itself in toto. This will be prejudicing the interest of the Monghyr Municipality and the people of Monghyr.

Prayed, therefore, that the commission should not take any cognizance of the allegations against Mr. Bhide and should not forward a copy of the petition to the Central Government.

Filed through,

CAMP : NEW DELHI, Sd. (P. K. MISRA)

The 15th April, 1969. *Chairman*

Monghyr Municipality

APPENDIX XII (v)

PETITION DATED 16.4.1969 FROM BARAUNI REFINERY IN REPLY TO PETITION, DATED 15.4.1969, FILED BY MONGHYR MUNICIPALITY

BEFORE THE COMMISSION OF INQUIRY ON GANGES WATER POLLUTION NEAR MONGHYR, NEW DELHI

Humble Petition on behalf of the Barauni Oil Refinery

Most respectfully showeth :

1. That the petitioner has received a copy of the rejoinder filed by the Monghyr Municipality to the petition of 14-4-1969 filed by the petitioner running into 24 pages.

2. That it is not within the competence and jurisdiction of the commission to adjudicate upon the issue raised in the petition filed by the petitioner and the rejoinder filed by the Monghyr Municipality and the argument advanced before the commission in writing by the State of Bihar. It is the appointing authority alone that can go into the matter, before the commission submits the report or during the preparation of the report or after the submission of the report.

3. That the point raised as to the constitution of the commission by the appointing authority and its subsequent disclosure of commitments of one of the members, Shri Bhide is most vital controversy in issue as the approver of BGD-14/BRD-39—the scheme for effluent discharge—and the effect and his participation on the advice tendered throughout the report of this commission has to be considered by the appropriate Government itself and cannot be decided by this commission as it is beyond the legal competence and approach of this commission.

It is, therefore, prayed that this petition may also be filed alongwith the two petitions of the petitioner to the appropriate authority, i.e. the Central Government in the Ministry of Petroleum and Chemicals in this case.

Filed on behalf of the Barauni Oil Refinery.

Dated 16-4-1969. Sd. A. K. SINHA

Advocate

APPENDIX XII (vi)

PETITION, DATED 16.4.69 FROM BARAUNI REFINERY AS A SUPPLEMENT TO THEIR PETITION, DATED 14.4.69

BEFORE THE COMMISSION OF INQUIRY ON GANGES WATER POLLUTION NEAR MONGHYR, NEW DELHI

Humble petition on behalf of the Barauni Oil Refinery

Most respectfully showeth :

1. That on 15-4-1969 Shri B. P. Singh, Counsel for the Barauni Oil Refinery, while commencing his argument told the commission that he would like to supplement his petition of the 14th April, 1969, running into 24 pages, by bringing to the notice of the appropriate Government, in this case the Central Government in the Ministry of Petroleum and Chemicals, the fact that the position of Shri K. R. Bhide as a member of the Commission has been described by the State of Bihar in the written arguments submitted by them at page 16, under the heading "scheme for sewage disposal and the discharge of the effluent by the Refinery" thus :

> "The Barauni Refinery was commissioned sometime towards the end of 1963. The General Manager of the Refinery Sri S. K. Mallick, alongwith his letter dated August, 19, 1961 addressed to Shri K. R. Bhide, Technical Adviser to the Govt. of Bihar, Patna, sent the report on sewage Disposal prepared by Shri Sanyal, Senior Civil Engineer, for public Health and Refinery township. He requested the Govt. of Bihar to sanction the said scheme for discharging the effluent into the river as per report. It may be mentioned that fortunately Shri Bhide is one of the members of the Commission and will be in a position to give his own assessment of the scheme prepared by Sri Sanyal and its actual operation, apart from the opinion that the parties may express thereon".

2. That the aforesaid passage fully depicts the commitments of Mr. Bhide to the scheme and the hope that he will assess the scheme and save it from peril.

3. That the submission of the State of Bihar cited above, puts Sri Bhide in a predicament of conflict, a dilemma, a dual clash of duties—one to uphold the scheme as the then Chief Engineer to give the approval, and another to bring a dispassionate, independent and uncommitted and unfettered approach as a member of the commission.

4. It is, therefore, prayed that this petition may be kept on record, and, a copy of this petition (submitted herewith) may be sent to the Central Government, alongwith the petition of the Barauni Oil Refinery dated 14-4-1969, as the point raised in this petition falls beyond the jurisdiction and competence of the Chairman and other members of the commission and it can be only dealt with by the appointing authority, i.e. the Central Government.

Filed on behalf of the Barauni Oil Refinery.

Dated 16-4-1969. Sd. A. K. SINHA

Advocate

APPENDIX XII (vii)

ORDERS PASSED BY THE COMMISSION ON 19.4.1969

The Learned lawyer for the Barauni Refinery has filed a petition on 14th April, 1969, running into 24 pages tracing the history of the inquiry and referring to BRD-39 has taken a plea that since Sri Bhide was the author of the approval of the scheme the vulnerability of which is on the anvil, he cannot sit as a member of the commission as that would amount to his being a judge in his own cause and it is high time he informed the appropriate Government about his position or the Chairman of the Commission apprise the Government of the situation. Sri Misra and Sri R. B. Singh, Counsels for the other side take strong exception to this and say that by this the learned Barauni lawyer wants to scuttle the whole proceeding and this should not be allowed.

We may point out that this plea is taken for the first time at the fag end of the inquiry when the commission was hearing the final arguments and after the learned counsels for the Monghyr Municipality and the Bihar Government had closed their arguments. The Learned Lawyer for the refinery knew fully well that Sri Bhide under Ex. BRD-39 as the Chief Engineer Bihar Government then had given the sanction of the scheme and if he had any objection to his sitting as a member of the commission, he ought to have

taken appropriate steps by approaching the competent authority before the inquiry began or raised an objection before the present commission at the time of the first hearing. The learned counsel did not take any such step, on the other hand participated in the inquiry which had lasted full one year. During the inquiry Sri Bhide and the other members of the commission had put questions regarding BRD-39 to the witnesses and the learned lawyer for the refinery also cross-examined them. But at that time also he did not raise any objection.

The Commission is a fact-finding commission and Sri Bhide is sitting in the commission as an expert on the Public Health Engineering aspect. His participation as such could not conceivably amount to his having any personal interest against the refinery. We, therefore, do not see any merit in the plea raised. The petition is accordingly rejected.

Sd. MANOHAR PERSHAD
Chairman,
Commission of Inquiry
Sd. N. V. MODAK
Member
Sd. K. R. BHIDE
Member
Sd. M. G. KRISHNA
Member

NEW DELHI,
Dated the 19th April, 1969.

DENE HALLOW
THE MALL
MUSSOORIE (UP)
Friday, 30th May, 1969

Chairman,
Commission of Inquiry on
Ganges Water Pollution near Monghyr,
Camp: Mussoorie.
Sir.

I submit herewith my recommendations on the claims preferred by the Monghyr Municipality in para. 42 of its Memorandum to the commission.

Yours faithfully,
Sd. K. R. BHIDE
Member
30-5-1969

Encls:

(i) Report on visit to Monghyr on 20th December, 1968 for inspection of record and works executed.

(ii) Tabular statement showing amount recommended against each claim.

(iii) Endorsement on vouchers presented by the Monghyr Municipality in support of their claims marked MMD 29 to MMD 38 and one voucher presented by the Bihar Govenment for work done by its PHED for the Monghyr Municipality marked BG-17.

M/B(D)173MofPCM&M—12

APPENDIX XIII

EXHIBITS MMD-29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43 & 44. INCORPORATING BILLS, VOUCHERS AND ESTIMATES OF PROBABLE COSTS FOR WORKS—PRESENTED BY THE MONGHYR MUNICIPALITY TO THE COMMISSION

INSPECTION REPORT

I visited Monghyr on Friday, the 20th of December, 1968, and spent the whole morning and noon in test-checking the bills and vouchers—with measurement books and stock books maintained by the Municipality. I also visited some of the sites of wells which were brought into use with dis-infectants and installations of Hand-Tubewells—throughout the city—to serve the emergency. The existing tanks—3 in number—in the Fort Area proposed to be desilted deepened and remodelled for storage of about 50 million gallons—were also shown to me. This has reference to Exhibit MMD 41 of the Municipality.

2. The following officers helped me in my Test-check and inspection of sites.

1. Shri Bachha Prasad, Executive Officer, Monghyr Municipality.
2. Shri Bijendra Narayan Singh, Water Works Supdt.
3. Shri Adya Saran Lal, Ex-Accountant of the Municipality, and
4. Shri R.R.B.P. Sinha, Executive Engineer, Public Health Engineering Dept., Govt. of Bihar.

I hereby record my thanks to them.

Sd. K. R. BHIDE
20-12-68
Member,
Commission of Inquiry on Ganges Water Pollution

BARAUNI
Dated the 24th December, 1968

CLAIM UNDER PARA. 42 OF THE MEMORANDUM OF THE MUNICIPALITY

S. No.	Particulars	Claim Rs.	Amount recommended Rs.	Remarks
1	Cost of desilting of settling tank	3,000·000	623·51	See MMD 37 for the recommendation.
2	Cost of resanding & overhauling sand filters	16,000·00	15,321·72	Do.
3	Cost of resanding and renovating the Mechanical Filters ..	43,000·00	22,338·54	See MMD 29 & MMD 38
4	Cost of excess bleeching powder used due to water pollution ..	700·00	116·00	See MMD 30 for the recommendation.
5	Cost of electricity consumed for flushing the Rising Main and Distribution main.	1,000·00	..	No voucher presented to assess the claim.
6	Cost of disinfecting wells in the town	500·00	..	Do.
7	Cost of cloaning distribution mains in the whole town (To be undertaken) Not done yet.	62,000·00	..	This work in the manner proposed is not necessary. The distribution is already functioning after initial disinfection with bleeching powder. What is required now is periodical scouring of the mains espeoially soon after the Monsoon which should be done if not already done.
8	Cost of lowering foot valve at Kastarnighat Pumping station ..	500·00	492·75	See MMD 31 for the recommendation.
9	Cost of supplying wator to the people in the whole town by water tankers.	11,000·00	3,244·17	See BG-17 for the rocommendation.
10	Cost of correspondenco (Telegrams and letters etc.)	800·00	139·05	See MMD 32 for the recommendation.
11	Cost of overtime and labour chargos paid to Municipal staff ..	2,000·00	571·86	See MMD 33 for the recommendation.
12	Expenditure incurred by the Chairman and his party in travelling due to incident.	500·00	555·00	See MMD 34 for the recommendation.
13	Cost of Hand Tubewells installed in the Town (25 Hand-Tubewells)	25,000·00	..	See MMD 36 for reasons of rejection of the claim.
14	Misc. expenditure	1000·00	219·00	See MMD 35 for the recommendation.
	Total ..	1,67,000·00	43,621·60	

Sd/. K. R.BHIDE,
Member

MMD-29

The Monghyr Municipality has claimed Rs. 22,338.54 on overhauling and resanding of Mechanical filter.

2. No doubt the order was placed in December 1964 and the material was supplied in March, 1966, but the fact that the material was lying there in stock for use as and when required—when the necessity for it arose in future—shows that had the unhappy pollution of the beds not occurred in March, 1968—it would have been still lying there unused to serve for future replacement gradually when the sand was depleted.

3. As a result of the pollution, the beds required to be overhauled and resanded immediately after the incident and the expenditure incurred through the agency of the Government Public Health Engineering Department was in order to repair the damage.

4. The demand of the Monghyr Municipality under para. 42—item 3—of their Memorandum is Rs. 43,000. I recommend that Rs. 22,338.54 may be allowed by the Government as damages under clause (vi) of the terms of reference.

5. Their subsequent claim for Rs. 25,194 incorporated in MMD 38 is inadmissible for reasons given under that exhibit.

Sd. K. R. BHIDE,
Member

MMD-30

The Stock Register was checked by me in Monghyr at the Water Works on Friday the 20th December, 1968 in the presence of the Chief Executive Officer, the Water Works Superintendent and the Executive Engineer, P.H.E.D. Government of Bihar.

2. Only the quantities shown on the 1st 2 pages attested by the Chairman—Shri P. K. Misra, on 17-10-1968 were placed before me for check. The quantities subsequently attested by the Chairman on 25-10-1968 were not placed before me.

3. The attested copies of 17-10-1968 show that only 115 kgs. were issued to all Jamadars of the Municipality on 4-3-1968 to disinfect all the wells in the Municipal area. The other quantity of 2 kgs. daily from 1st to 31st is not stated to have been used for disinfecting the wells or tanks. This is presumably the consumption on disinfection of drains and insanity Gullies and Nalas and cannot, therefore, be allocated to "Damage" under clause (vi) of the terms of reference.

4. The consumption of 18 Drums (720 kgs.) in March and April 1968 certified by the Chairman on 25-10-1968 was not brought to my notice when I checked the Stock Register on 20-12-1968. It is not clear also to whom these Drums were issued and for what purpose. The value of these—Rs. 730.80 cannot be assigned to "Damage" and is not, therefore, admissible.

5. The value of 115 kgs. comes to Rs. 116 approximately and I recommend that this should be allowed against item 4 of the demand of the Municipality under para. 42 of their Memorandum.

Sd. K. R. BHIDE,
Member

MMD-31

This claim comes under item 8 of para. 42 of the Municipal Memorandum. "Lowering of foot valve at Kastarnighat Pumping Station". The vouchers and the total have been checked and the expenditure incurred comes to Rs. 492.75. This may be allowed under clause (vi) of the terms of reference against the claim of Rs. 500.

Sd. K. R. BHIDE,
Member

MMD-32

Vouchers for Rs. 139.05 represent expenditure incurred by the Municipality on correspondence (Telegrams and letters etc.) caused by the pollution of the Ganges at the Kastarnighat Head Works of Water supply.

2. The payment of Rs. 139.05 is recommended against claim of the Municipality under item No. 10 of para. 42 of their Memorandum to the commission.

Sd. K. R. BHIDE,
Member

MMD-33

Vouchers for over-time paid to the Municipal Staff and for labour engaged to clean the Reservoir and other structures of the Water Works are to the total value of Rs. 571.86. The cleaning was required to clear the pollution from oil of these structures and comes under the purview of clause (vi) of the Terms of reference.

2. The claim of Rs. 571.86 is recommended for payment against item 11 of para. 42 of the Municipal Memorandum.

Sd. K. R. BHIDE,
Member

MMD-34

Amounts under items 3 to 9 represent expenditure incurred by the Municipality to place their case before the Inquiry Commission and do not, therefore, come under the purview of clause (vi) of the terms of reference.

The amount of Rs. 555 is admissible and may be allowed against item 12 of the claim under para. 42 of the Municipal Memorandum.

Sd. K. R. BHIDE,
Member

NOTE:

Although the claim under this item is for the expenditure of Rs. 500 only, there is a general remark at the foot of all the claims that "the expenditure shown is approximate and not exact".

In the circumstances, as vouchers for Rs. 555 representing actual expenditure incurred have been produced, the amount of Rs. 555 has been recommended.

Sd. K. R. BHIDE,
Member

MMD-35

Payment of the 1st item only—Rs. 219 expended on engaging a loudspeaker to announce that the oily water should not be drunk without boiling etc. is recommended as it falls under the purview of clause (vi) of the terms of reference.

2. Other items represent expenditure incurred on placing the case of the Municipality before the Enquiry Commission and as such are not directly connected with loss or damage sustained by the Municipality which has to be made good by the Refinery.

3. The sum of Rs. 219 is to be allocated to item No. 14—Miscellaneous expenditure—demanded by the Municipality under para. 42 of their Memorandum.

Sd. K. R. BHIDE,
Member

MMD-36

Expenditure to the value of Rs. 23,829 has been incurred by the Monghyr Municipality on sinking 25—1½" diameter Tube-wells in different parts of the city—through the agency of the Public Health Engineering Department of Government. The work on some of these wells was checked by me on 20th December, 1968, in the presence of the Executive Officer, Monghyr Municipality and the Executive Engineer, PHED. The work has been properly executed.

2. These wells were not ready to serve the Emergency between the 3rd and the 9th of March, 1968 and could not be used by the citizens—if they are properly maintained—in future only.

3. The expenditure does not, therefore, come under the purview of clause (vi) of the terms of reference as no direct loss or damage has been sustained by the Municipality.

4. The claim under para. 13 of their demand —under para. 42 of their Memorandum cannot be entertained.

Sd. K. R. BHIDE,
Member

MMD-37

Desilting of settling tank—

Item 2 of the Demand of the Municipality under their Memorandum para. 42—Rs. 623.51.

Cost or resanding and over-hauling sand filters—

Item 2 of the Demand of the Municipality under their Memorandum para. 42—Rs. 15,321.72.

These amounts are recommended for payment as they fall under the purview of clause (vi) of the terms of reference. Vouchers have been produced in support of these expenditures actually incurred.

Sd. K. R. BHIDE,
Member

BRD-38

(1) Vouchers from 1 to 8 removed to MMD 34.

(2) Amount under 9 and 10 above viz—Rs. 25,194.00 is inadmissible as it does not come under the purview of the clause (vi) of the terms of reference. It is not clear if the expenditure was actually incurred after the incident that is after March, 1968. Special repairs and replacements—carried out must not be as a result of damage to the plant and instruments from polluted oily water supply between the 2nd and the 10th of March, 1968, but from wear after prolonged use of the equipment in years preceding the incident.

Moreover the date of servicing charges indicates that apparently work was done in September, 1967. If it is an error, it has not been corrected subsequently.

Sd. K. R. BHIDE,
Member

BG 17

Voucher for the expenditure of Rs. 3,244.17 on temporary water supply to Monghyr town by carrier system on account of pollution of Ganges water has been incurred by the P.H.E.D. of Government on behalf of the Monghyr Municipality. The Executive Engineer, P.H.E.D. will raise a debit against the Municipality for the recovery of this amount.

2. In item No. 9 of para. 42 of their Memorandum the Municipality has claimed a sum of Rs. 11,000 for the supply of water to the Monghyr people in the whole town by water tankers. These water tankers were supplied to the Municipality by the PHED to facilitate the distribution of supply during the period of absence of water supply from the Ganges on account of its pollution from the 2nd to 9th of March, 1968.

3. This amount of Rs. 3,244.17 is payable under clause (vi) of the terms of reference and is, therefore, recommended for payment.

Sd. K. R. BHIDE,
Member

APPENDIX XIV

O.M.S. (R)

REPORT ON SECTOR 6

The worsening position of sector 6 as has been prevailing in the past is quite evident and well known. Many a times emergencies have been created by sudden influx of huge quantity of oil and water coming to sector 6 which continues to be in bad condition and invariably creates crisis and constitutes an operational limitation as well as a hazard in this refinery. Of course, some of these problems could be traced back to inherent deficiencies in the design because the capacity of the various equipments and flow pattern etc. have been underdesigned or rather ill-designed.* Furthermore, many of the factors and provisions were not envisaged and thus not taken into consideration. So much so, no provision had been thought of or provided for the storm/rain water, which during monsoon period results in flooding of the oil-separator—area and thus renders the oil recovery system and water pumping out to the Ganges inoperable and inefficient. It will also be pertinent to mention that the water leaving the refinery is heavily contaminated with oil which in any country or society will not be permitted. It is high time that sector 6 is thoroughly revamped taking into account the increased flow of oil and water coming to this area so that oil recovery system may be improved which itself will pay of by way of increased recovery of oil for subsequent re-processing in this refinery.† Also, it will mean less pollution of the Ganges water, which as such is also our responsibility to ensure that the oil content in out-going water is maintained within permissible limit.

Given below is a list of jobs by way of Civil and Mechanical work which may be examined, studied and elaborated so that our oil recovery system may be put on a sound footing for the benefit of operations in this refinery.

Already, civil work for providing drainage in this area has been undertaken under instructions of the General Manager. The drainage facilities will be reviewed after the Monsoon period is over when we expect to be better acquainted with the problems and difficulties presented during heavy rains in this refinery.

Sd. K. P. TULI,

Production Engineer

27-9-1967

Encl: List

GM—Copies have been passed on to the various departments concerned, Will DGM(T) kindly see what jobs need be tackled immediately to bring about improvement in condition‡. It may not be possible to tackle all the logs at a time, but certain amount of priority can be decided upon and the jobs taken up for completion to safeguard position in sector 6§.

Sd. BALWANT SINGH,

General Manager

28-9-1967

DGM(T) (Mr. Harnal) on return from tour.

The following jobs need immediate attention.

1	Job to be done	Mech. 3	Elec. 4	Civil 5
1. *Separator Basins*	(*i*) Concrete slab to fire-walls around the separator basins			√
	(*ii*) Fire-walls to be raised atleast by half a meter			√
	(*iii*) Cross-over bridges should be repaired			√
	(*iv*) Platform approach to be given for operating valves for skimming	√		√
	(*v*) Steam line-proposed to be brougnt from TPS should be extended to sep. basins.	√		√
	(*vi*) Levelling up of fire-walls			
2. *Emergency Basins*				
	(*i*) Fire walls to be raised by at least half a meter			
	(*ii*) Platform approach to be given for operating valves for skimming	√		
	(*iii*) Cross-over bridges to be repaired			√
	(*iv*) Concrete slab to fire-walls around the emergency basins			√
	(*v*) Stream-line, proposed to be brought from TPS should be extended to emergency Basins.	√		√
	(*vi*) Leaky gate valves at E. Basins to be rectified or replaced	√		√

*PA Put up every Tuesday.

†PA Put up for next Tuesday meeting. Sd/—G. S. Harnal 6/10.

‡GM/21374; 29-9-1967.

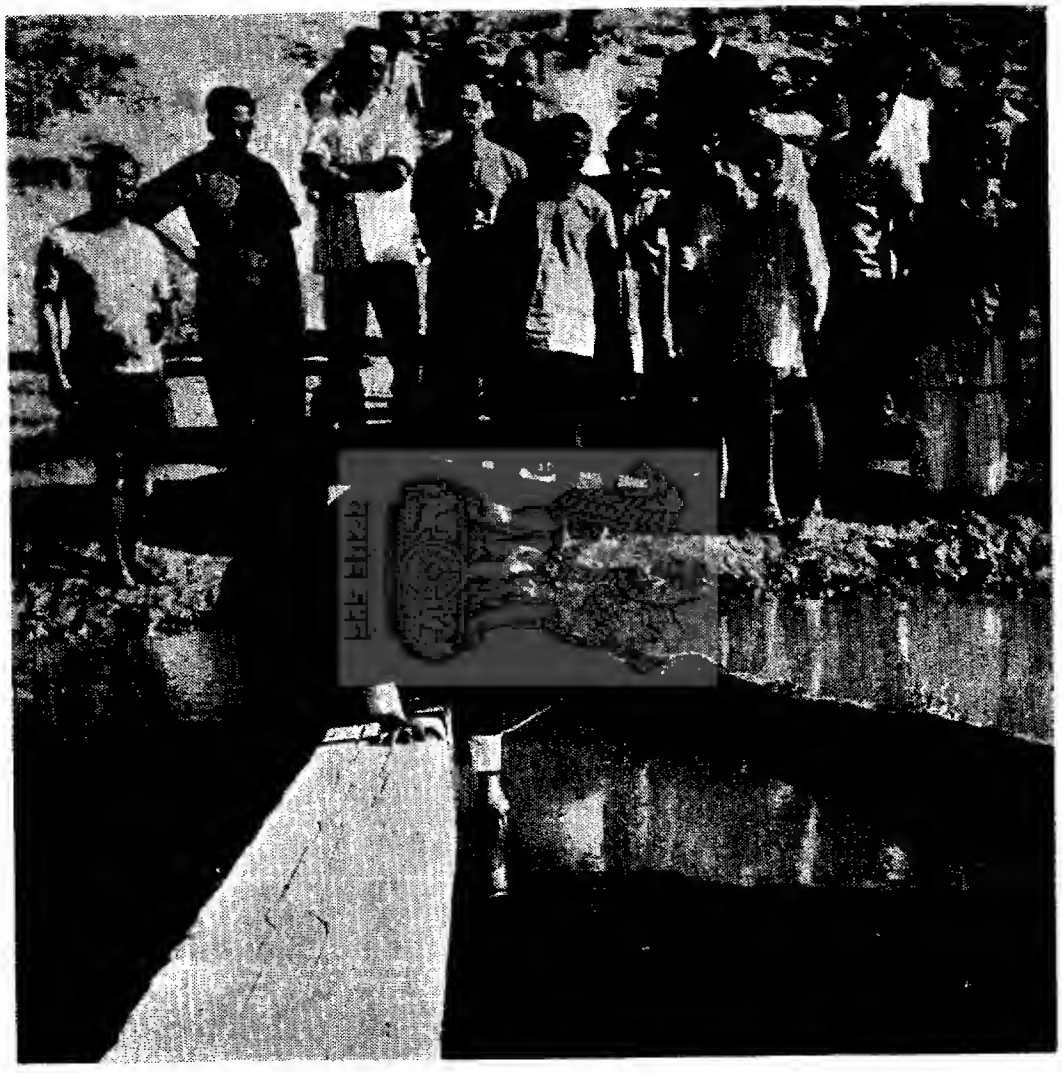
§GM/L/4676; 27-9-1967.

1	2	3	4	5
3. *Guard Basins*				
	(*i*) Brick lining up to be given from inside around the guard basins ..			√
	(*ii*) Curb-wall (6″) may be given around the guard basin in order to prevent any foreign material to go in, with storm water.. ..			√
	(*iii*) Manually skimming arrangement may be provided by arranging one wooden slab (1/2″) covering up the width (6″ away from both sides) and giving two rope lengths at the ends, tied upto two wooden poles on both sides			√
4. *Siltaccumulator*				
	(*i*) Brick lining up to be given from inside			√
	(*ii*) Area around to be cleaned of empty Bitumen drums lying there			
	(*iii*) Fire-walls to be raised by atleast half a meter			√
	(*iv*) Levelling up of fire-walls			√
	(*v*) Cleaning up of silt accumulator should be taken up; sludge level is increasing slowly	√		√
5. *Sand Trap*	(*i*) Pulley arrangement to be provided for lifting up (Jali) for cleaning purposes	√		√
	(*ii*) Steam line should be extended to this trap	√		√
6. *J.N. 532 Oil Pit Pumps*				
	(*i*) Permanent pulley arrangement to be provided for lifting up pumps and strainers, if cooked			
	(*ii*) Curb-wall to be given after raising up the pump slab, for holding and in turn directing oil spillage to nearest industrial sewage manhole			√
	(*iii*) Leaks in cooling water system of H1, H2 (pumps) to be rectified	√		
	(*iv*) Preventive maintenance everyday is a "must"	√		
7. Job. No. 525	(*i*) Pump capacity to be raised or additional pump is required ..	√	√	√
8. *Tks. CN, N2 N3, N1*	(*i*) Mechanical tape of N1, to be rectified.	(Instrument Mech.)	√	
	(*ii*) Steam coils of N2, seems to be leaking; make much noise if operated	√		√
	(*iii*) Fire-walls to be levelled up and cross over bridges to re required			√
	(*iv*) Outside gadgets for operating suction rising arms, have become tough to operate; they require greasing occasionally	√		
9. *Pump slab* H3, H4				
	(*i*) curb-wall (6″) to be given for holding and directing oil spillage to nearest industrial sewage manhole	√		
	(*ii*) When tanks 11 and 12 are full, no condensate from knock-out drums can go to the Tks 11 and 12 due to high head pressure; so by providing, by-pass with one valve in between suction and discharge of either H3 or H4, condensate can be taken into any slop Tk (N1—N4)	√		
	(*iii*) Preventive maintenance is a "must"	√		
10. *Approach roads*				
	In rainy season, water is stagnant as it is low level area near about control room. Approach roads should be made on elevated ground level			
	(*i*) In between control room and E. Basins			√
	(*ii*) In between control room and J. N. 532			√
	(*iii*) In J. N. 532 & Sep. Basins			√
	(*iv*) In E. Basins and Sep. Basins			√
	(*v*) In Sep. Basins and sand trap			√
	(*vi*) In Sand Trap and Silt Accumulator			√
	(*vii*) In Silt accumulator and TK form			√
	(*viii*) Small pathway around G. Basins for manual skimming ..			√
11. *Control Room*				
	(*i*) Bridge level (indicating all the levels) is still not commissioned (Instr.)			
	(*ii*) Automatic arrangement for operating outside pump valves (J. N. 532) (Instr.) still not commissioned			

1	2	3	4	5
12. *In General*				
	Grass should be removed instantly. In retarding grass-growth, either spray of weed killer or spreading over earth mixed with bottom sludge from silt accumulator crude oil Tks etc. may be tried			√
13. *Lighting system*				
	In general, it is not adequate. More powerful lights with change in direction of bulbs in Hood-lights required			√
14. *Steam supply*				
	Steam header near the oil pit, separators is necessary			√
	The above mentioned points may be scrutinized and in case any clarification/suggestion is required PE may be contacted			

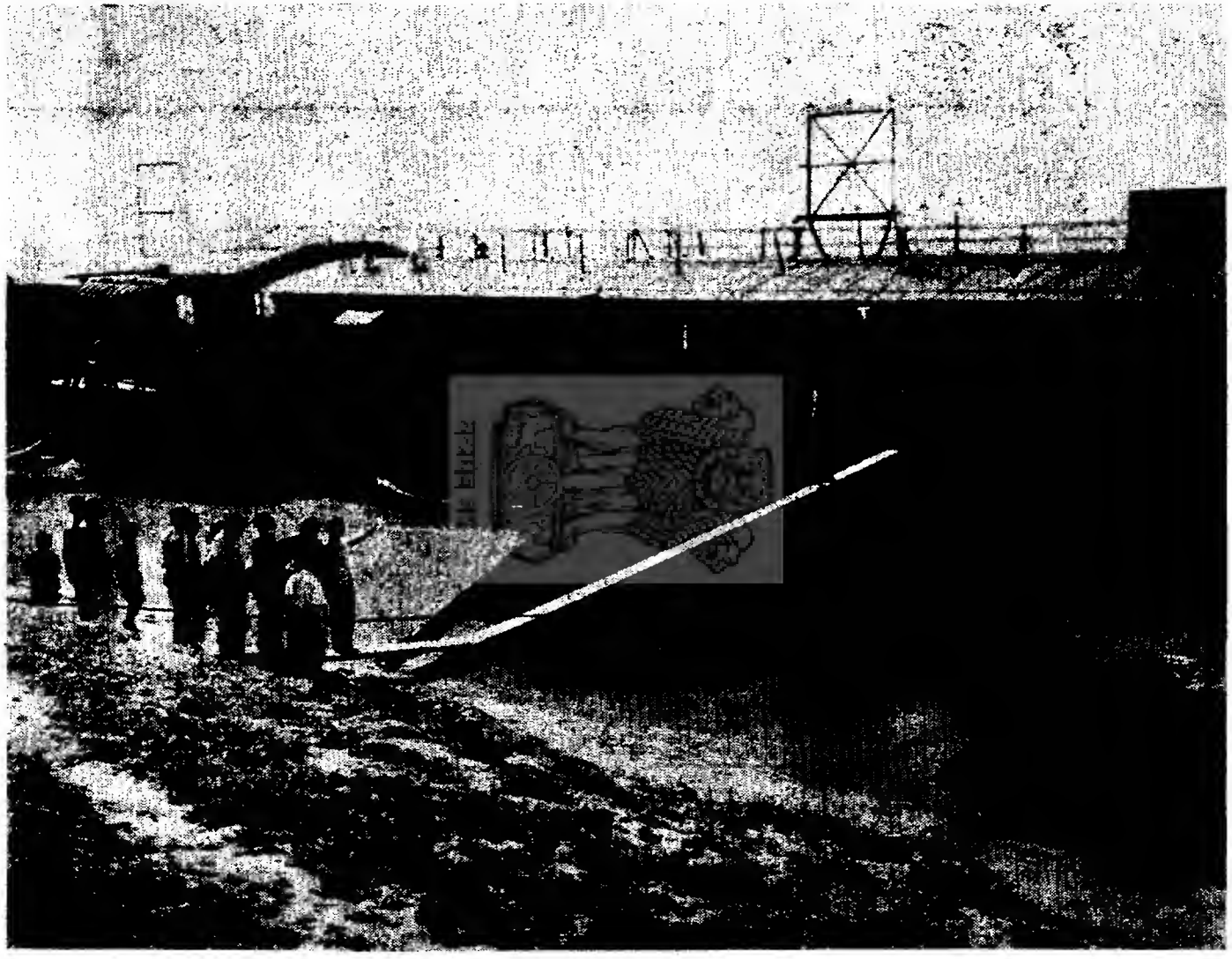
L/B(D)173MofPCM&I—1,100—28.11.69—GIPS

APPENDIX XV

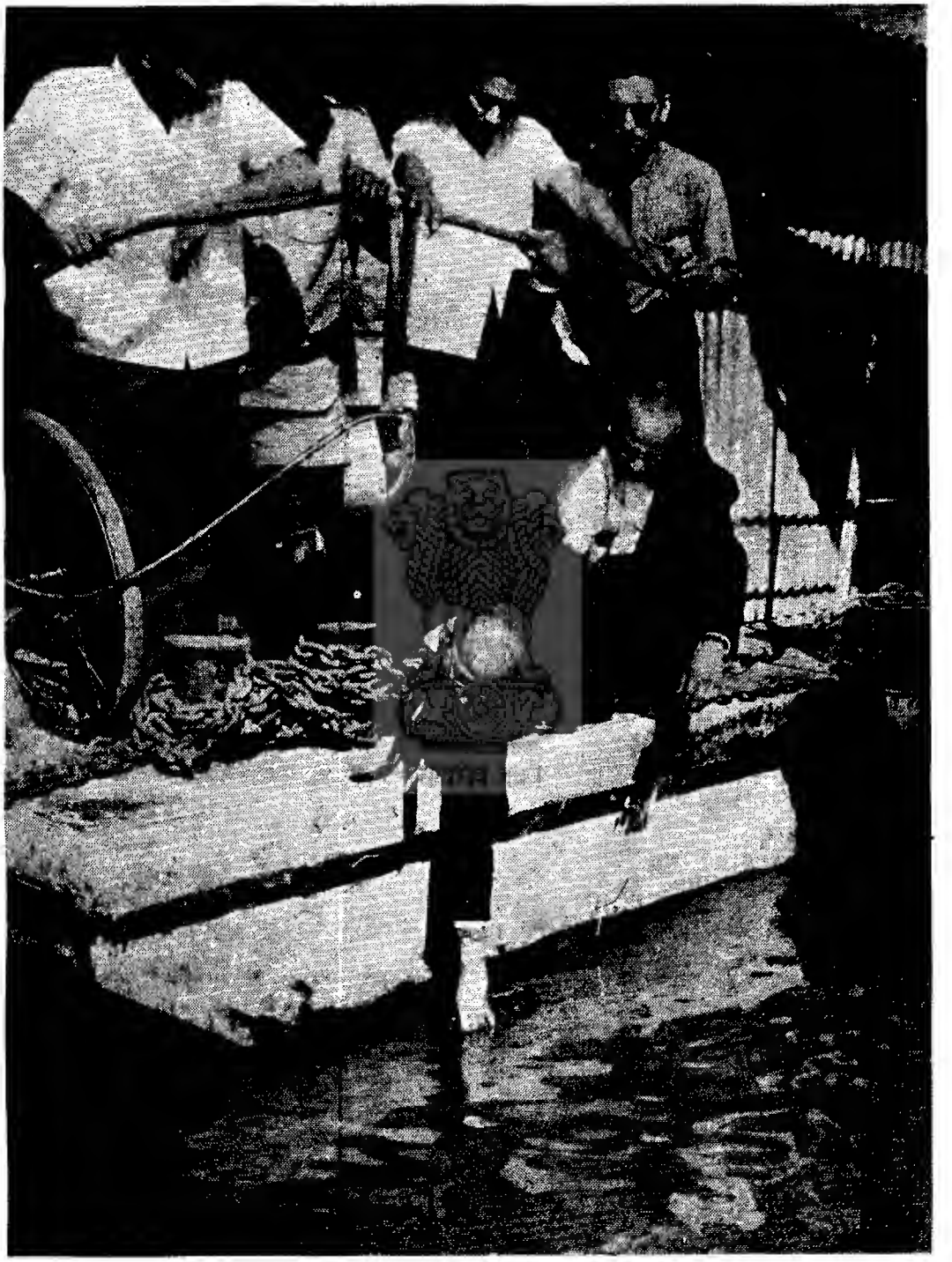


Sample of water being collected by refinery officers near the approaching plank of the Jamalpur water supply dock. The thick oil refuse can be seen in the water in the foreground of the picture. (*Ex.* 1—*plate* 1) 4.3.1968.

APPENDIX XV



A view of the water supply floating dock of Jamalpur (Monghyr). The dark portions in the water on right and centre are the oil refuse. (*Ex.* 4—*Plate* 4) 4.3.1968.



Sample of water being collected by refinery officials from the water supply dock of the Monghyr Municipality at Kastaharnighat. (*Ex.* 5, *plate* 5, *D*/4.3.68).